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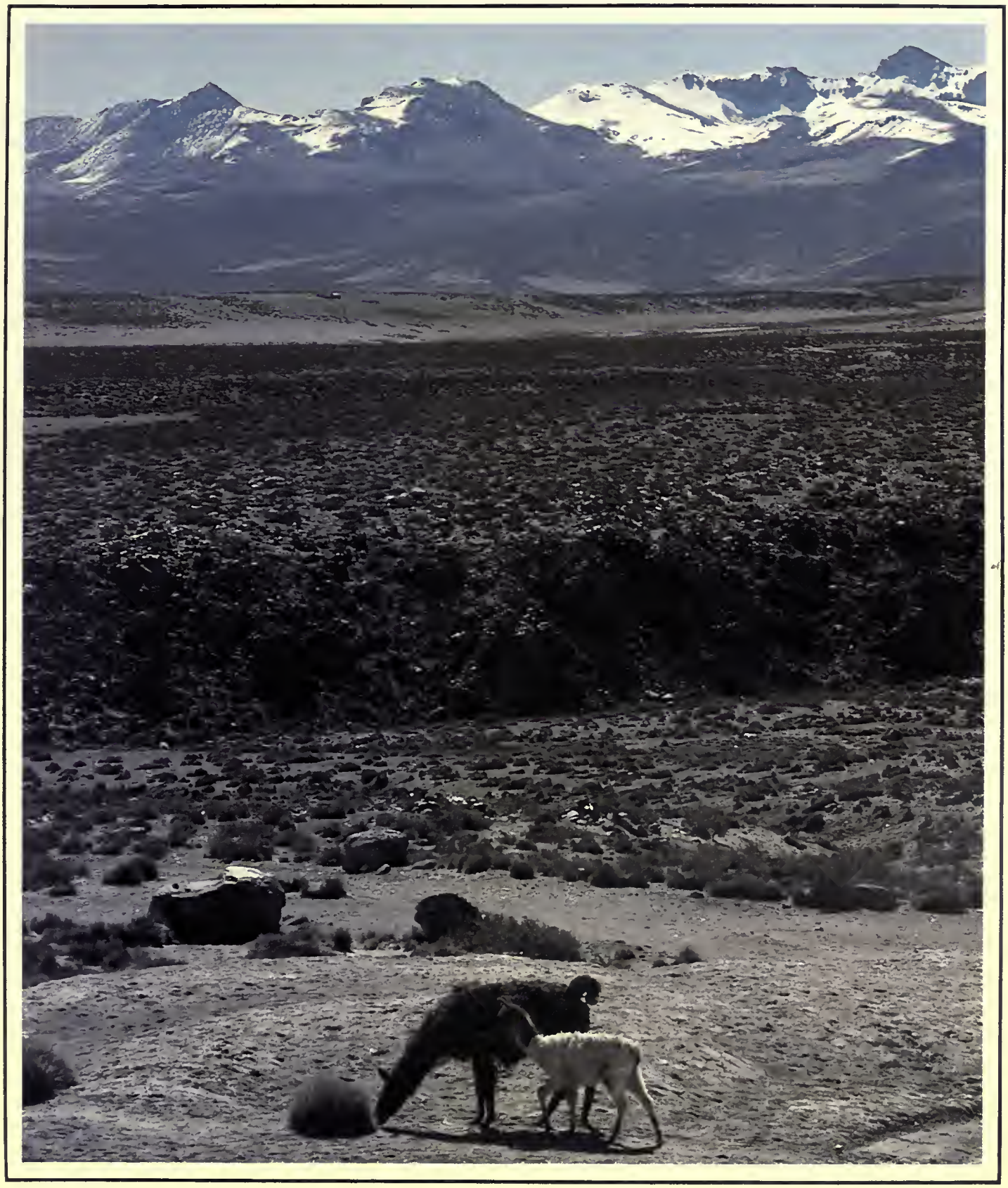

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COVER

The high grasslands of southern Peru (here over 4300 meters above sea level) are the home of llamas and alpacas, the domesticated New World camelids. These animals are important today, as they were 1,000 years ago, for the wool and meat they provide. Photo by Robert A. Feldman.

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New Light on Peru's Past

Recent discoveries on the site of a large copper mine in southern Peru have led to the formation of a new archeological program in which Field Museum will play a major role

By Michael E. Moseley, Robert A. Feldman, and Irene Pritzker

Photos by Robert A. Feldman

On the eve of Columbus's New World landfall, the largest empire in the world was probably Tahuantinsuyu, or the "Land of the Four Quarters," as the Inca called their sprawling realm. The empire stretched along the mountainous Andean backbone of South America for more than 4,300 kilometers, an expanse rivaling the Roman Empire. There is today no Andean nation of comparable magnitude; nor in the past did larger states arise, neither in the New World, nor south of the equator in the Old World.

The four-fold division of the realm was made for administrative purposes, and reflects salient geographical differences within the far-flung empire. Contisuyu was the southwestern quarter of Tahuantinsuyu and comprised much of what is today southern Peru. The Inca conquest of the southern Andes and their domination of earlier civilizations is not well known or understood. Smallpox and other diseases of European origin decimated the empire as the Conquistadors were plundering it, and the ear-

Field Museum archeologist Robert Feldman examines ventilator opening in wall of recently identified Inca storehouse upriver from Cerro Baul.

Michael E. Moseley is associate curator of Middle and South American archeology and ethnology; Robert A. Feldman is visiting assistant curator of South American archeology; and Irene Pritzker is in the Post-Graduate English Program at the University of Chicago and is a coordinator of the Contisuyu Program.

liest written accounts of Contisuyu begin after Andean civilization was in a state of collapse.

To learn more about the ancient civilizations of Contisuyu, we scaled the lone precipitous path winding up the cliff-face of a towering mesa, called Cerro Baul. This great rock pinnacle juts out of the center of the little explored Moquegua Valley, and like a stone battleship, guards passage between the high mountains and desert coastlands of southern Peru. Our quest was the ruined city that sprawled over the summit of this sheer-sided natural fortress. Like the mesa of Masada, which confronted the Romans in ancient Israel, we believe Cerro Baul was the invincible stronghold where Inca legions were held at bay by the defenders of Moquegua and Contisuyu. The one path to the summit is steep, narrow, and runs a tortuous course between ancient defensive walls and rock cliffs where assaulting troops could easily be thrown back.

The heroic resistance by the people of Moquegua is recorded in an account written hundreds of years ago by Garcilaso dė la Vega, the son of a Conquistador and an Inca noblewoman. He reports that after learning of the Inca emperor Mayta Capac's setting forth with his armies to conquer Contisuyu, the populace armed and provisioned themselves. They then withdrew to the towering mesa overlooking their homeland, which could only be Cerro Baul. The Inca legions could not scale the cliff-faces or take the great natural bastion by storm, nor could the conquest of Contisuyu proceed beyond this defiant fortress; so Mayta Capa encamped his forces around the great hill and set siege so that the defenders could obtain neither food nor water from the valley below. The isolation of the great mesa proved to be a liability: its defenders became its prisoners.

Garcilaso tells of the fall of Cerro Baul. After fifty days without food or water, the elders sent the children down in hopes that the Inca would show mercy and that the young would not die for the resistance of their fathers. But Mayta Capac did not wish to harm any of the people, so he sent the children back up the mountain with food and water for all. Seeing the Inca's compassion, the defenders surrendered and submitted to Inca rule.

Upon reaching the summit of Cerro Baul,

Villages of later prehistoric periods were often built on defensible hilltops overlooking the river valleys. Elaborate systems of canals and terraces allowed crops to be raised on steep slopes.

Fortress-like mesa of Cerro Baul (center background) provided refuge to inhabitants of Moquegua when the Inca came to conquer the valley. It fell after a 50-day siege. Storehouses (foreground) built by the victorious Incas today lie in ruins.

the weary hiker is today greeted by an amazing view of grandeur that reaches from the snow-covered peaks of the Andes down toward the Pacific coastlands. Far below the mesa the Rio Moquegua glimmers like a distant ribbon. The river is only 125 kilometers long, and its waters cascade down the western face of the Andes, descending more than 4,500 meters before emptying into the ocean. This exceptional change in altitude creates an ideal ecological research situation, because over a very short horizontal distance the Rio Moquegua transects a great range of environments.

This ecological diversity is not random, but stratified by altitude into distinct environmental belts stacked one atop another. In this situation, archeologists can follow human development back in time through a series of very different physical settings. These settings range from the "altiplano," or high plain, where llamas and alpacas pasture, to the rocky seacoast, where fishing is the way of life. The basic ecological divisions of the watershed are defined by rainfall, which is seasonal above 2,000 meters and completely absent at lower elevations. Indeed, the lower valley cuts through the world's driest desert, where decades can pass without even a shower.

From the top of the towering mesa, it is possible to catch a glimpse of the distant Cuajone open pit copper mine in the remote mountains from which the Rio Moquegua descends. The mine began operations in 1976, and while it was under construction the local community and mine officials became concerned as they realized that they were discovering one archeological monument after another. At this point, Southern Peru Copper Corporation, the mine operators, approached Field Museum for advice, and it was this contact that brought us to Moquegua for reconnaissance purposes and to the summit of Cerro Baul, where we hoped to begin unraveling Inca from pre-Inca civilization in the valley.

Because the Moquegua drainage is unexplored archeologically, our initial reconnaissance has been concerned with discovering the numbers and types of sites and monuments in the region. Here, the use of a small airplane owned by the mine has proved invaluable in providing a rapid overview of the many ruins tucked away in desert canyons and mountain corridors. This reconnaissance has shown that the valley contains more than 500 archeological sites spanning some 10,000 years of human endeavor. Discoveries range from painted caves through cities older and larger than Machu Picchu to the citadel-city of Cerro Baul. Apart from imposing architecture, many ruins contain a myriad of artifacts, ornate textiles, and mummified human remains. Broad expanses of abandoned agricultural terraces cover the mountainsides, and ancient canals built with sophisticated engineering methods reach across the desert plains.

Today Cerro Baul is covered by a ruined city some 8 hectares (20 acres) in size. A series of plazas and large buildings—some that were once two stories tall—claim the central area. Next to them are large, deep pits, probably granaries and

cisterns for storing water. The houses of the ancient city are jumbled and closely packed. Here and there are large grindstones (weighing over 45 kg, or 100 pounds), which have been laboriously hauled up from below; broken pottery litters the ground.

Discovering ancient monuments is both exciting and easy when done by airplane. However, dating such discoveries is difficult and tedious in an unexplored region where the sequence of past civilizations is not known. The Inca conquest and assimilation of Moquegua left a distinctive archeological stamp on many of the later prehistoric sites. However, among the thousands of sherds of pottery among the ruins of the mesa-top city we did not encounter Inca materials. It may be that the Emperor Mayta Capac forced the citadel to be abandoned in order to forestall any possible rebellion once his legions moved on to conquests further afield—this remains for future research to establish.

The ruins do contain pottery in a pure Tiwanaku style, and effectively date at least part of the ancient city to A.D. 500-700. Tiwanaku was a great pre-Inca empire, and its capital city was near the edge of Lake Titicaca on the altiplano, high above Cerro Baul. We have encountered pottery of this imperial style at scattered sites all the way down to the port city of Ilo, at the mouth of the Moquegua Valley. Because the desert around Ilo is even drier than that of ancient Egypt, archeological preservation is exceptional, and ancient cemeteries yield fine textiles, feather headdresses, and other delicate objects, including elaborate tapestry tunics of Tiwanaku style. As yet, we do not know if these magnificent Tiwanaku tapestries—or the pottery at Cerro Baul—reflect a military conquest like that of the Inca, or if more peaceful colonization was involved. We know that the Aymara kingdoms, which arose around Lake Titicaca after the fall of Tiwanaku, maintained peaceful colonies of farmers in the Moquegua Valley, and this pattern might extend back to the earlier empire.

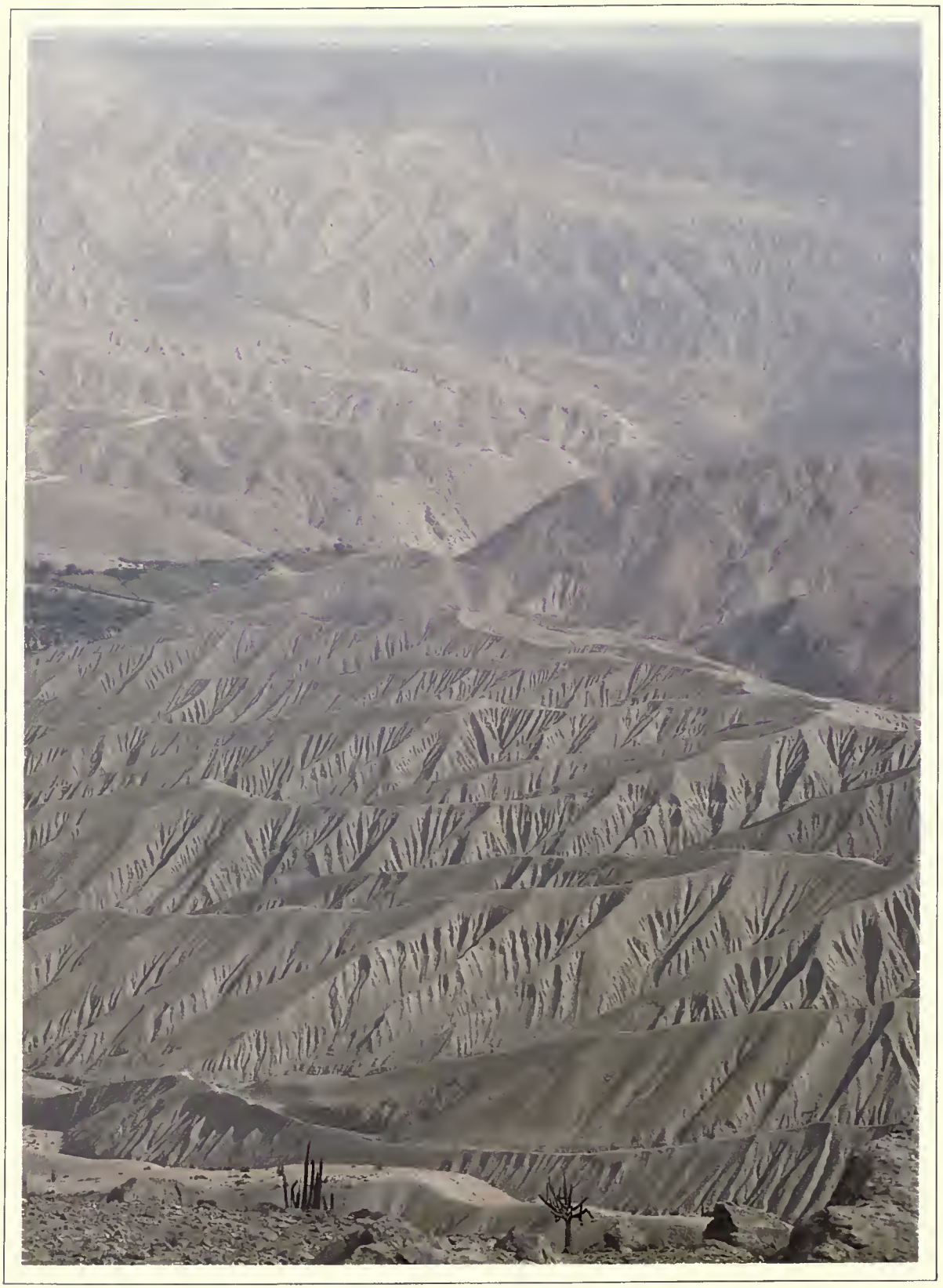
Looking out from the summit of Cerro Baul, great tracts of abandoned terraces can be seen flanking the valley and extending back into the mountains. Agricultural terraces such as these were so characteristic of the highlands of Tahuantinsuyu that the Spanish Conquistadors gave the native name for the terraces, *andenes*, to the whole cordillera—the Andes. Farming on any scale within the Andean highlands must be based on terraces, as the valleys are steep-sided, with very little flat land even near the rivers. The engineering problems presented by the steep hillsides and rapidly flowing rivers were enormous, though successfully overcome. A far greater area was farmed in the past than today. Where modern irrigation farming ends, the canals often do not: they continue for kilometers through remnants of abandoned terraced fields.

The terraces are not the only evidence of long-term agricultural changes. Long canals and irrigation systems now make the desert area on the floor of the valley productive, but hundreds of hectares of now-barren land on either side of Moquegua reveal a webwork of small feeder canals, showing that this area too was once farmed. A strong wind, occurring daily, has blown away most of the soil from the fields, but the canals are preserved because of their stone lining or by thick layers of hard silt deposited in them during their use.

Coastal Chiribaya-style pottery (ca. A.D. 1200) *features multicolored geometric designs, probably derived by simplifying and stylizing the more naturalistic Tiwanaku designs from the Bolivian altiplano.*

Nowhere in the world do people simply abandon arable land; but nowhere in the world has as much land been abandoned as in the Andes. Survey has shown that many of the Moquegua terraces are associated with pre-Inca settlements as well as with Inca sites, but questions such as how they were watered—from canals or by rainfall—and why they are not now in use remain unanswered. Study of the terraces can provide important information on past climatic conditions, and whether there have been changes in rainfall, evaporation, or river flow—changes that could have important implications for the future of the region.

When and why these fields were abandoned are also important questions. The Inca chronicler Garcilaso de la Vega relates that when the Inca Mayta Capac conquered the Moquegua area it was underpopulated, so he



Much of the lower part of Contisuyu is dry and barren, with farming now limited to narrow river valleys (center). In the past, canals carried water out of valleys to fields on some of these wastelands.

brought in settlers. The abandoned fields appear to be more closely related to the earlier Tiwanaku villages than to the later, scantier Inca remains. It appears that the Moquegua Valley saw several peaks and declines in population. The causes for the abandonment of the agricultural lands need to be understood, especially the question of whether these causes could recur and affect the area's modern inhabitants.

After the Inca's armies took Cerro Baul, they

moved its defenders out of their villages and resettled them—along with the colonists that were brought in to pacify and repopulate the region—in two new villages. Garcilaso named only one of them—Moquegua—so there has been some speculation about the second. We think we have found the evidence needed to answer this question.

We discovered spectacular terrace systems and a major complex of monumental architecture in the mountains above the sierra town of Torata, within the sight of Cerro Baul. The complex is tied to an Inca highway that descends the crest of a long mountain ridge covered with abandoned terraces. Walking down the road, the visitor is first greeted by a scatter of *chulpas,* circular masonry burial towers. Chulpas are an altiplano attribute that we have not found in the lower coastal valley. Below the ruined towers, the ancient road is straddled by an impressive group of stone-walled Inca storehouses. The walls of these four ranks of rooms still stand high, after almost 500 years of abandonment. Small openings in the sides at ground level—below the raised floors inside—served as ventilators and show that these storerooms held agricultural produce, undoubtedly gathered from the stone-faced terraces that blanket the hills on all sides.

A short distance away is a fortified village, its jumbled walls presenting a very different aspect from the regimented storerooms. Pottery found on the site shows a mixture of local and Inca styles, a pattern often repeated in the Inca provinces. When they conquered an area the Incas would not replace the local culture, but rather would superimpose their own. Physical evidence of the Incas, such as architecture and pottery, is often restricted to sites they actually occupied. Thus, we find the mixture of pottery styles at the village adjacent to the storerooms, while in an architecturally identical village only a kilometer away, Inca pottery is extremely rare.

An even greater contrast is seen down in the valley by Torata, where there is an Inca administrative center adjacent to a local village. The Inca center is severely regimented, with identical rooms grouped inside walled rectangular blocks lining a grid of streets. To build their city, the Incas chose (and possibly partially leveled) a flat saddle on a ridge. The rocky promontory at the end of the ridge is occupied by the local village. Its rooms are built on terraces following the curve of the hill and lack the order and regularity of the Incas' rigid blocks. Very little Inca pottery was found at the local village, showing that even though they existed side-by-side, the culture of the conquerers made few inroads on the local pattern.

The Inca administrative center identifies the

10,000-year-old paintings found on the walls of two caves near Toquepala show ancient hunters stalking wild game of Andes. Unfortunately, vandalism threatens to destroy these priceless artifacts. One of the aims of the new Contisuyu Program is to prevent similar destruction of Moquegua's cultural heritage.

Heavy grindstones found on Cerro Baul show that people once lived in ruined buildings on its summit. Pottery shows that this occupation dates back some 1,500 years.

Lights of Villa Cuajone (lower left) signal new future for Cerro Baul and other prehistoric sites in Moquegua. Money provided by owners of Cuajone copper mine wil help contribute to protection and study of these valuable monuments of Contisuyu's past.

adjacent village as the second of the two founded after the fall of Cerro Baul. It is possible that we are too literal in our reading of Garcilaso's chronicle, and that this village was not a single concentrated settlement such as we are accustomed to. The storehouse site and its village are about 5 kilometers from the Torata center, but they might have been part of the same "village" or community. More work remains to be done, but we know where to look.

Below the Inca center, in the middle and lower Moquegua basin, the severity of the desert conditions greatly restricts where people can live: the occupation was densely packed along the river banks and shoreline, but almost absent in the intervening desert regions. Canal systems and irrigation agriculture make the valley zone productive, and the modern city of Moquegua is located there. Today, large areas of the river valley are given over to grapes, which are used to make Moquegua's renowned Pisco brandy. In the past, maize, beans, cotton, and fruit trees such as avocado were the principal crops; abundant food remains found in the village middens will provide important information on past crops and diet.

Only a few parched olive groves can be found on the Pacific coast, where water is extremely scarce. The copper company must desalinate seawater at great expense in order to supply the needs of the workers at its smelter north of the city of Ilo. In the past, limited farming was possible with the use of short canals from springs at the base of the Andes. However, fishing and marine collecting was the most important way of life on the coast. Extensive shell middens blanket the coast on either side of Ilo—some are 5,000 or more years old.

In sharp contrast to the coast is the altiplano, a relatively flat tableland situated more than 4,000 meters above sea level. It is cold and outwardly forbidding. Numerous snow-capped peaks, many volcanic, tower above the plains, reaching heights over 5,400 meters (17,700 feet).

Human occupation of the altiplano is sparse and scattered, restricted to areas with favorable combinations of water, temperature, and wind. While life is definitely not easy, an extremely successful adaptation has been developed, based on herding the llama and alpaca and on cultivating a suite of high-altitude, frost-tolerant plants, potatoes in particular. The prehistoric record on the altiplano goes back many millennia. Survey of a recently abandoned farmstead there turned up not only the expected glass and tin cans, but also stone flakes and projectile points that show the site to have been occupied over a span of up to 5,000 years.

The range of archeological monuments shown to us by officials of the Cuajone mine and by interested and concerned local residents, as well as the additional sites we found, confirm the importance of Moquegua. The discovery of this cultural wealth created a great deal of excitement

at Field Museum as well as in Peruvian institutions. Luckily, Southern Peru Copper Corporation was interested in helping, and offered matching funds to develop a program for the preservation and study of the valuable sites. As a result, the Contisuyu Program has recently been created.

The Contisuyu Program is a cooperative Peruvian-U.S. agreement involving Field Museum, the Peruvian Museum of Health Sciences, and the Peruvian National Cultural Institute. These three institutions have agreed to combine forces to organize a multinational project of investigation, conservation, and regional development of the cultural heritage of Moquegua's portion of Contisuyu. The ultimate goal of all involved with the program is that the archeological sites be protected, studied, and shared with interested visitors from all parts of the world.

From a Peruvian standpoint, the involvement of Field Museum is very important. From its beginnings, Field Museum has had a great interest in Andean research, and is expert in conceptualizing and implementing broadly based programs such as the Moquegua sites require. The transfer of technical and scientific knowledge to Peru for purposes of taking inventory and protecting the sites is vital to the success of the Contisuyu Program, and it is in this area particularly that the Field Museum is uniquely qualified to contribute. In addition, an area as large as the Moquegua Valley requires not just the ability to investigate a particular site, but the ability to manage a large scale, self-perpetuating business enterprise. Few museums in the world know how to do this. Field Museum does, and it is willing to share its expertise with Peru.

The impact of modern civilization on the region, and the urgent need for the Contisuyu Program, can be seen at the oldest known monument in Contisuyu: the Toquepala Caves. Some 10,000 years ago hunter-gatherers lived in the Toquepala Caves near the Quebrada Cimarron, a now-dry stream running from the sierra to the desert. The midden garbage of these ancient residents accumulated in thick deposits covering the floors of two small caves, and on the cave walls the people painted a graphic record of their presence.

Designs in red, black, yellow, and green show ancient hunters amid herds of guanaco, a wild relative of the domesticated llamas and alpacas. Other animals, including armadillos and condors, are also shown, along with enigmatic geometric designs. These hunting scenes are an irreplaceable window back into the distant past, long before farming assumed importance.

Unfortunately, vandalism has destroyed many of the caves' paintings. The caves were discovered more than twenty years ago by survey teams planning Southern Peru Copper Corporation's first mine at Toquepala. The mine funded a study of the paintings, and archeologists were also sent from Lima. A fence was erected to protect the paintings, but people dug under it and tried to chip off the designs, probably to sell them; they only succeeded in shattering and destroying many precious paintings. Recently, the corporation erected a new and much stronger barrier, so further destruction, it is hoped, will be prevented.

Extremely dry conditions in Moquegua desert have preserved a wide range of perishable remains, including this wooden spoon handle. Design is carved in Tiwanaku style (ca. A.D. 500) and depicts two condor heads (at top), cactus flower (top center), and unidentified plant form.

A major goal of the Contisuyu Program will be to increase public awareness and appreciation of the importance of archeological remains. By building local pride, we seek to prevent the destruction of more of Moquegua's patrimony.

A major step forward in unravelling the mysteries of Moquegua has been the formation of the Contisuyu Program. Not only does the program provide necessary finance, it also creates official Peruvian enthusiasm by virtue of the fact that it owes its existence to the concern shown by a responsibly minded large American corporation. It is with great anticipation that Field Museum, together with our Peruvian colleagues, looks forward to the enormous task of preserving, studying, and developing the cultural patrimony of the Valley of Moquegua, and to bringing into focus the civilizations of Contisuyu. □

ANCIENT AIR BREATHERS

by W. D. IAN ROLFE

Most paleontologists would still agree with Darwin that "the whole science of geology loses glory from the extreme imperfection of the record." Yet, now and again a new find of fossils is made which reminds us of what we are missing—another window onto the past is opened.

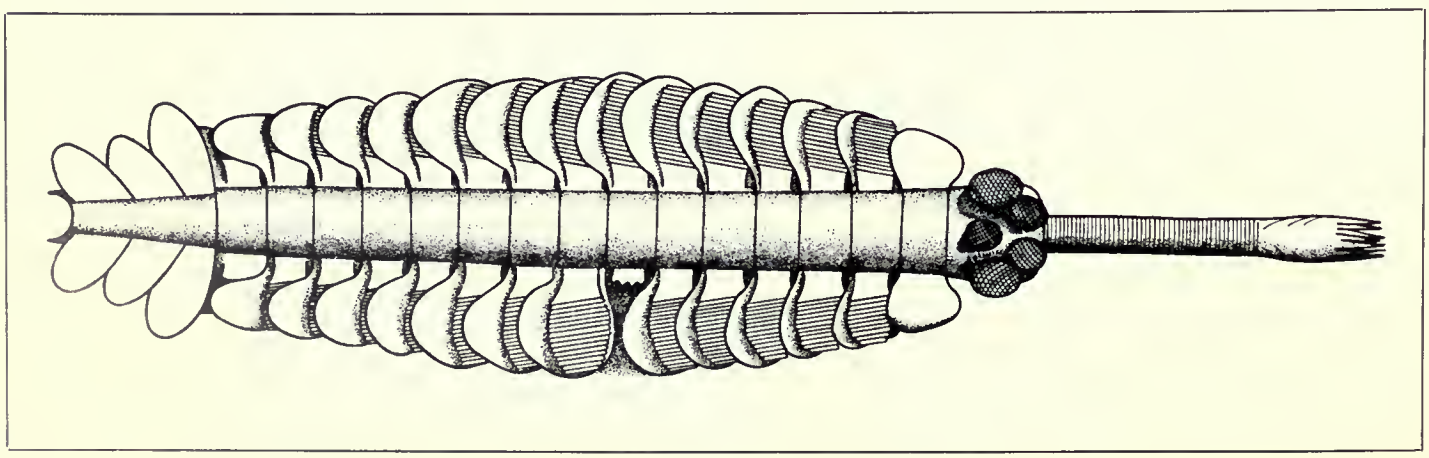
The most famous of these finds is the Burgess Shale (530 million years old) of British Columbia, with its multitude of soft-bodied forms. An international research team led by H. B. Whittington, of Cambridge University, has shown that there is still much that can be learned from these fossils, discovered in 1908. Or the more local, but scarcely less famous, Mazon Creek Pennsylvanian biota (300 million years old) of Illinois, with its 800 or so different animal and plant fossils, mostly still unique to Illinois. These are chance occurrences of a spectacular kind.

No less remarkable, however, may be finds made by workers patiently processing rock in their laboratories. One thinks of the beautiful Permian silicified brachiopods recovered by G. Arthur Cooper and his co-workers at the Smithsonian Institution, by acid digestion of blocks of the Glass Mountains, Texas. Or the minute, crystal-clear copepod crustaceans and spiders dissolved from concretions in the Mojave Desert by Alison Palmer. We take for granted the routine recovery of large masses of often exquisitely preserved spores with their resistant sporopollenin coats.

Yet, few geologists are prepared to take the risk of expending vast effort in processing large volumes of rocks on the off-chance that they might contain some new fossils. The German geologist Erich Malzahn was willing to take such a chance: by washing many tons of Permian marl, he recovered a few, minute, exquisitely pyritized crustaceans of groups previously unknown as fossils. Klaus Müller, of Bonn University, has suggested that such occurrences are not as few and far between as we tend to think: we just do not bother to look for them adequately. Müller should know, since in the course of dissolving phosphatized water fleas from Swedish Cambrian limestones, 510 million years old, he noticed that a few had soft parts attached to them. By carefully dissolving less than nine pounds of the rock he was able to recover thousands of shells, 400 of them with their soft parts and multisegmented limbs preserved intact.

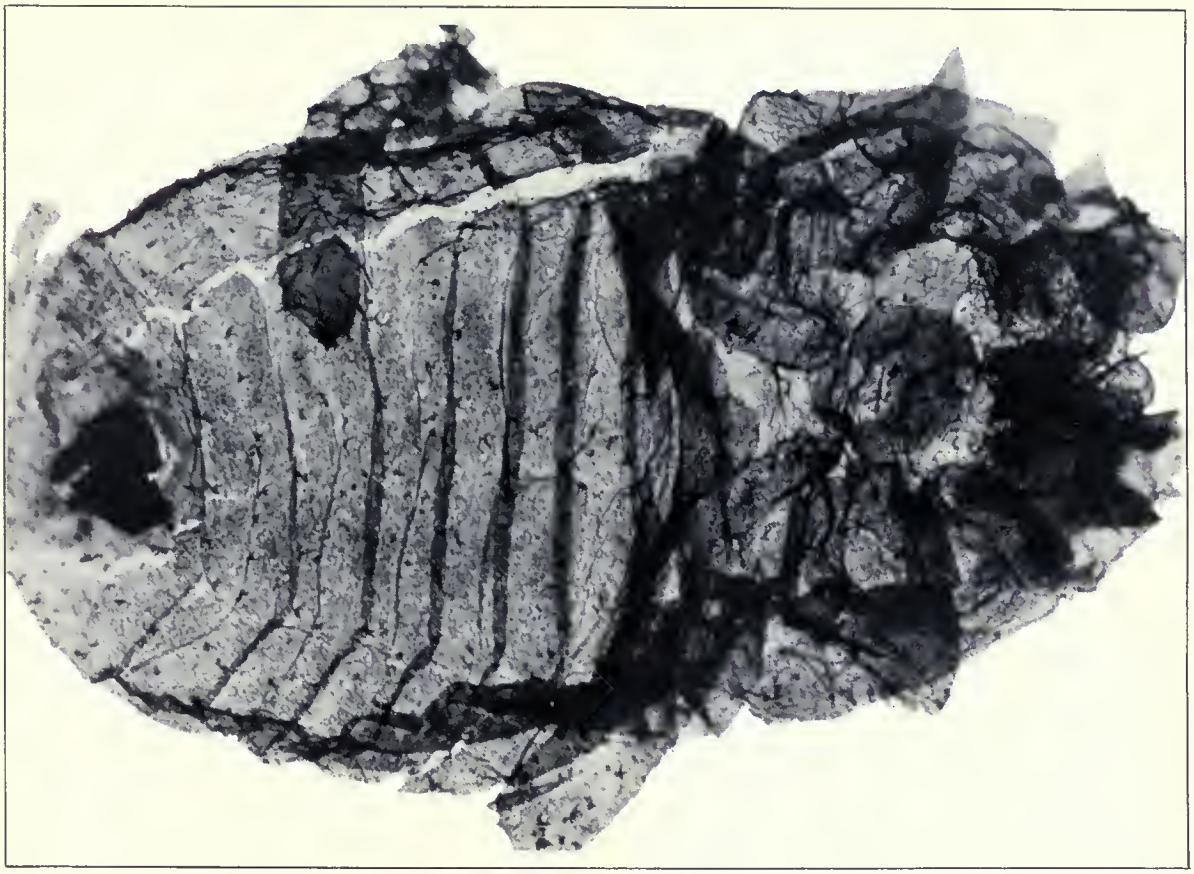
Knowledge of life on ancient land surfaces is much harder to come by. This is partly for the obvious reason that land animals have to end up in a water-laid sediment before they can be found as fossils—a rather unlikely event. Yet one of these remarkable chance finds has just been made by paleobotanists Pat M. Bonamo and Doug Grierson of the State University of New York at Binghamton.

Whilst etching out fossil plants from the



Burgess shale fossil Opabinia *may be an early descendant of the segmented animals from which annelid worms (such as the earthworm) and arthropods were derived. This reconstruction provoked laughter when first shown at a normally sober, scientific meeting—a tribute to the animal's unique combination of characters. (After Whittington)*

W. D. Ian Rolfe was recently at Field Museum under the Department of Geology's Visiting Scientist Program, investigating pod-shrimps of Mazon Creek, Illinois, and Mecca shale, of Indiana; he also initiated the work on Devonian microarthropods of New York, discussed in this article. Rolfe has returned to his position as deputy director of the Hunterian Museum, University of Glasgow.



New trigonotarbid arachnid, 2 mm long (1/12 inch), from the Middle Devonian (380 million years old) of Gilboa, New York. It closely resembles animals of similar age from Rhynie, Scotland, and Alken, West Germany. (Photo courtesy Pat M. Bonamo and D. Grierson)

middle Devonian (380 million years old) mudstones of Gilboa, New York, to use their own words, "We made an extremely exciting and fortuitous discovery. While we were examining a preparation with the dissecting microscope we found an almost complete small arthropod, swaying gently in the water filling a depression left by the acid removal of the rock matrix, the tips of its legs being still embedded in the unetched rock. We were able to remove it with cephalothorax and abdomen still intact." Since then, they have found more specimens, most of them fragmentary.

That first animal Bonamo and Grierson found is a trigonotarbid arachnid—a group of daddy longlegs-like animals, extinct since the Pennsylvanian. The finest details seen on any fossil arthropod can be seen on this species—including the first slit sense organs—the "strain gauges" which detect minute deformations in arachnid exoskeletons. These structures, only a few thousandths of a millimeter in length, were spotted by Field Museum's John Kethley, associate curator of entomology. In an equally striking specimen were the poison fangs of what was obviously a centipede. Ralph Crabill, the senior U. S. worker on centipedes, was excited to find that this most closely resembles a living form on which he had worked for many years—*Craterostigmus;* known today only from New Zealand's South Island and Tasmania. He could state with

Phosphatized ostracode (water flea), 0.2 mm long, acid-etched from Upper Cambrian (510 million years old) limestone in Sweden. (Photo courtesy of K.J. Müller)

Leg tip of Gilboa, N.Y. trigonotarbid, showing well preserved spurs, and hairs still set in sockets. (Photo courtesy Pat M. Bonamo and D. Grierson)

Poison fangs of the oldest known centipede, from 380 million-year-old rocks of Gilboa, N.Y. They most closely resemble Craterostigmus *—known today only from New Zealand and Tasmania. (Photo courtesy Pat M. Bonamo and D. Grierson)*

authority that this could not belong to any centipede living in North America today. An important point, since other authorities had begun to question whether these acid residues were not simply contaminants—minute scraps of arthropod that had, perhaps, fallen out of a crack in the ceiling.

This sort of thing had happened before—supposed outer-space spores found in the Orgeuil meteorite proved to be only ragwort pollen contaminants that had survived superficial cleaning of the meteorite. The possibility of such contamination was ruled out here by the presence of trigonotarbid, and also by the extreme flatness of the materials—only a few thousandths of a millimeter thick: it was difficult to imagine how such Recent contaminants had got so squashed, unless they really had been entombed in a column of rock, originally miles thick. As more groups were recognized, it became clear that the fossils belonged to groups that had long been thought to be primitive. That was true of *Craterostigmus*, and of the single mite specimen recovered. Identification of mites is very much a matter for specialists, and John Kethley recognized that this was one of the oribatid mites in which Roy Norton, of the S. U. N. Y. College of Environmental Science and Forestry, was expert. Norton was able to compare it with living ctenacarids, a family of Palaeosomata which, as the name suggests, had long been considered among the most ancient of mites.

Other animals are represented by the smallest of fragments, and one needs to enlist the help of many specialists in order to run them down. Two such experts, Otto Kraus in Hamburg and Bill Shear of Hampden-Sydney College, Virginia, independently identified one scrap as the tip of the leg of a tarantulalike arachnid. These animals have a very patchy distribution at the present day, suggesting a former much wider, tropical-subtropical distribution. Fossils had been known from the Carboniferous of Mazon Creek, as well as from Europe, but once again this find was much older than any hitherto.

The work of identifying the fragments—most of them less than a millimeter across—continues. E. Laidlaw Smith, of the California Academy of Sciences, has identified one perforated plate as a possible machilid—a silverfish, long thought to be primitive, which would make them the earliest true insects. It will take a long while, and probably much more etching out of material, before a complete picture of the ancient air-breathers of Gilboa can be built up.

Land fossils of this age are very rare, and known from only two other localities in the world: Scotland and Germany. The first of these finds was made only in the 1920s, when the tough, splintery Rhynie Chert of Aberdeenshire, Scotland, was found to contain not only some of the earliest land plants, but also a whole fauna of minute arthropods. This fauna comprises several minute mites, a shrimp resembling the living fairy shrimp, a possible spider, a springtail insect (of which the spring organ has just been discovered) and some trigonotarbid arachnids very like the Gilboa beast. These animals are exquisitely preserved in the clear silica of the chert, since they were killed and petrified *in situ* when an ancient peat bog was inundated with hot-spring waters.

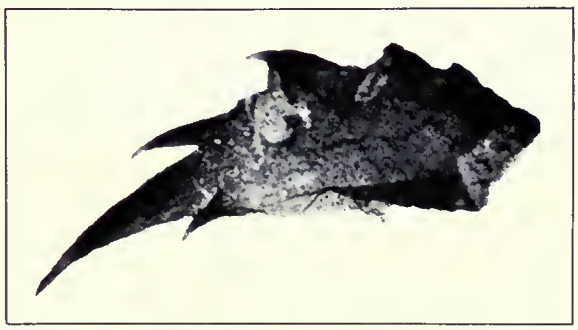
Paleobotanist A. G. Lyon, then of Cardiff University, was sectioning some of the chert to study the plants in detail when he was startled to

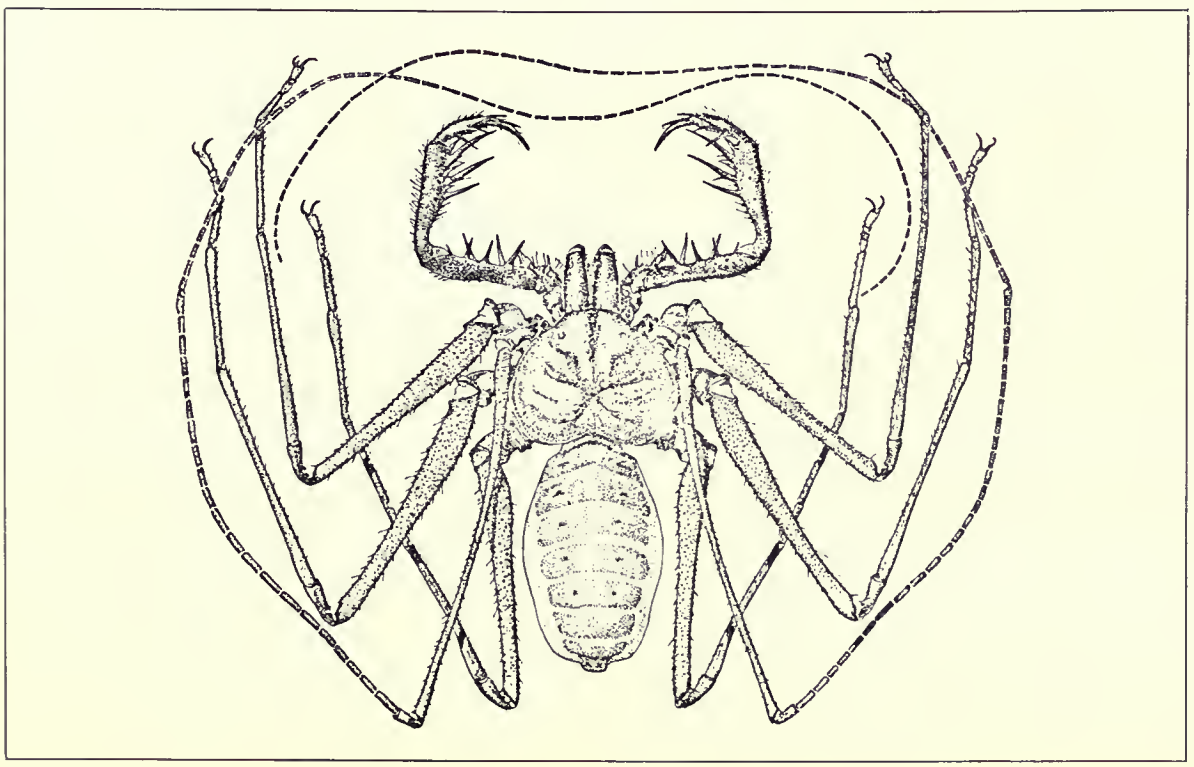
see some finely laminated structures *inside* the abdomen of one of the arachnids. He recognized these as lung-books—the structures by which many land arthropods breathe today. These are the oldest, and remain the only fossil, lung-books known, and really confirm that these animals were air-breathers, as had been deduced from their general resemblance to living spiders and their kin.

A second find of these Devonian land forms was made only in the 1960s at Alken, on the River Mosel, in Germany. The fossils are not so spectacularly preserved as at Rhynie and Gilboa, but a similar trigonotarbid was recognized and described by the late Leif Størmer of Oslo University, a leading and inspiring worker on early fossil arthropods since the 1930s. This deposit probably formed in a lagoon, and the presence of many sea scorpions, some of them possibly amphibious, at this locality suggests the land fossils were washed in from a nearby shore. Also present is *Eoarthropleura*—the dawn *Arthropleura*—a possible ancestor of those giant, six-foot-long millipedelike animals known from Mazon Creek.

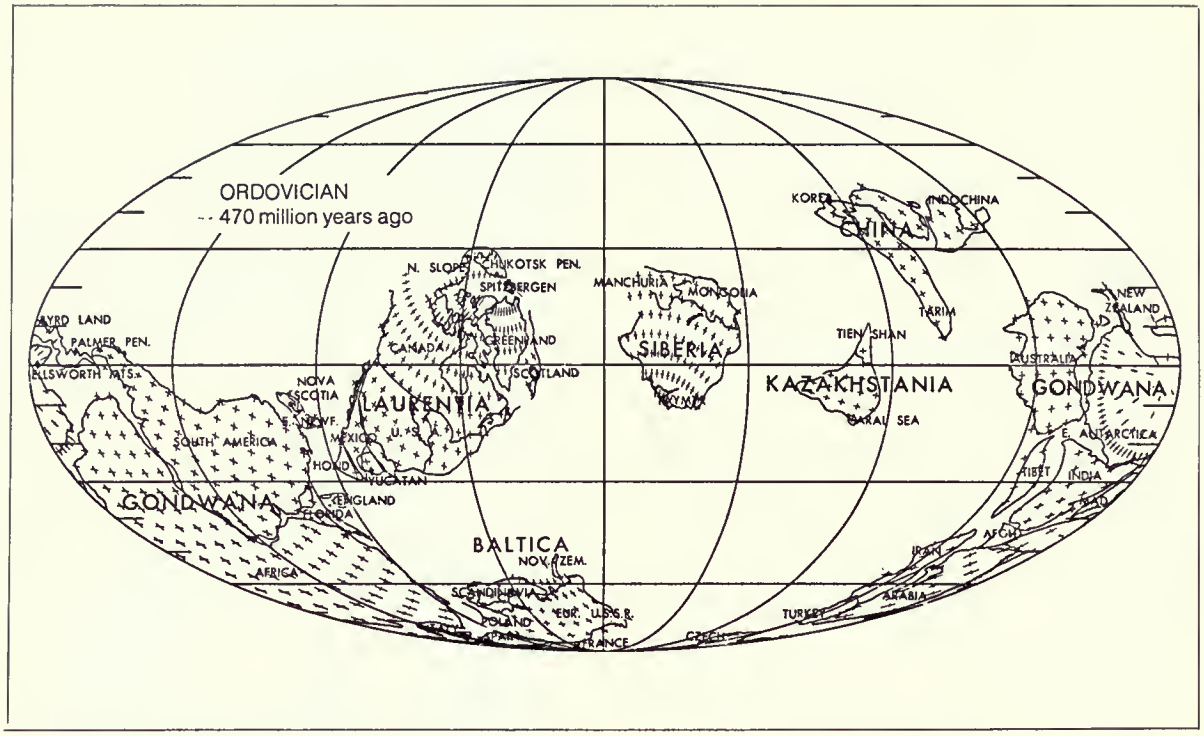
The similarity of the undoubtedly terrestrial trigonotarbid arachnids of Gilboa to those of Rhynie and Alken raises several interesting points about these early air-breathers. First of all, they were even then so well developed and specialized that biologists think they must have evolved onto land long before the Devonian. When the original ancestor, or ancestors, of millipedes, centipedes, and insects left the sea to hit land, it (or they) probably diversified rapidly into the many different types of land arthropods.

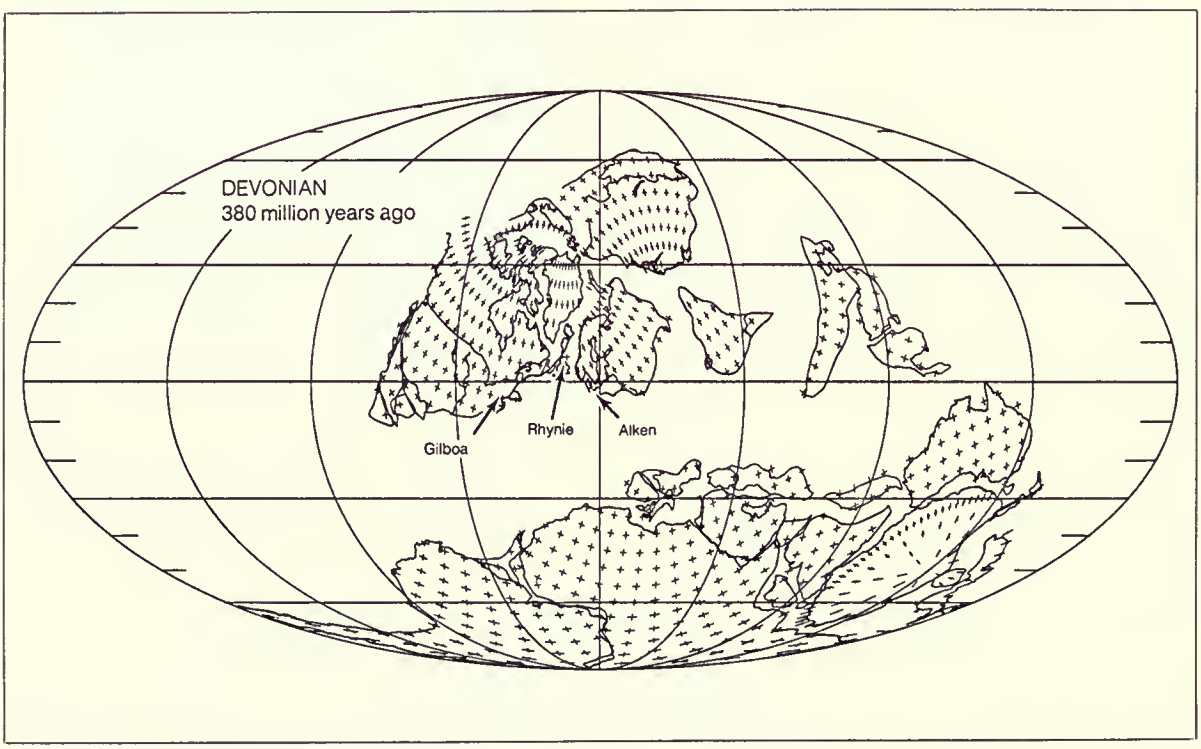
Maps of the ancient geographies of those times, recently compiled by workers at the University of Chicago, show a chain of continental fragments, scattered around the globe in low tropical latitudes. Our ancestral trigonotarbid must therefore have emerged onto either one of these land masses—Laurentia or Baltica (see maps)—and then spread to the other after these continental plates collided in the late Silurian/early Devonian, 400 million years ago, to form the larger continent of Laurussia. The present-day distribution of close relatives of the Gilboa air-breathers shows that further major expansion of their range must have occurred—and the recent discovery by Mario Hünicken, of Córdoba University, of a giant fossil spider with a body thirteen inches long and a leg span of almost two feet, in the Carboniferous of Argentina, tells us that at least some of these territorial gains had been made by the Pennsylvanian, 280 million years ago. The maps also show that Laurussia, bearing its cargo of Gilboa arachnids, had im-





Above: *Fossil tarantulid claw (0.5 mm long) from Gilboa, N.Y. (Photo courtesy Pat M. Bonamo and D. Grierson.)* Below: *The living tarantulid* Charinus, *of Africa. (After Millot)*





Maps of ancient geographies, showing that the three known sites of the oldest terrestrial faunas are confined to the on. Laurussian plate, in Devonian times (380 million years ago). (After Scotese et al, *© 1979, The University of Chicago)*

pacted with the southern hemisphere plate known as Gondwana just before this time, allowing the arachnids to spread far and wide, ultimately to reach the places that their descendants inhabit, often as relict faunas.

If this is a true account of events, it enables us to make an intriguing prediction, testable by future, worldwide collecting: *terrestrial arachnids older than the Carboniferous should not be found outside the Laurussian plate*. In other words, none should occur in Gondwana rocks—or in Kazakhstania, China, or Siberia, for that matter, since such land animals could not cross the sea barriers that separated those former continental plates. It will be interesting to see how long this prediction can survive. □

Latin American Neighbors Day

Dia de los Vecinos Latinoamericanos

Sunday, January 31
12 noon-4:00 pm

Come celebrate Latin American Neighbors Day, Sunday, January 31, from 12 noon to 4:00 pm at Field Museum. Enjoy tours, lectures, touchable exhibits, craft projects, games, and dance performances that highlight the cultures of Mexico, Central and South America.

"Nuevo Ideal" offers two half-hour dance performances at 1:30 pm and 3:30 pm in Stanley Field Hall. Sixteen dancers (ages 7-17) perform lively folk dances from the many states of Mexico: Vera Cruz, Oaxaca, Tamaulipas, and Jalisco. The featured dances include shotis (polkas), the bamba, the zapateado, la tortuga, pinotpa nacional and uapango (the cowgirl dance). "Nuevo Ideal" performs under the direction of Ophelia Solano. Tours of the Latin American halls are offered in English and Spanish. Explore "The World of the Aztecs" (*"El Mundo de los Aztecas"*), "Mesoamerican Civilization," and "Textiles of Ancient Mexico." Watch a pottery demonstration that replicates traditional Indian handbuilding techniques.

Children can enjoy tours scheduled just for them —"Exploring the New World" and "Animals of South America" (in English and Spanish). After the "Animals" tour, children can make an animal baby out of clay to take home. Young people can play piñata, learn to grind corn using the mano and metate, make *Ojos de Dios* ("God's Eyes")—a symbol of peace and happiness—and spin wool into yarn using a drop spindle. A special *Discovery Room* full of touchable exhibits relating to life in Mexico will provide fun for the whole family. Children can try on clothes from Mexico, create a *mola* design out of colored paper, make paper flowers and listen to Mexican folktales in English and Spanish.

There is a special performance by the Clemente Steel Band of Roberto Clemente High School at 2:45 p.m. in Stanley Field Hall. Fifteen musicians will perform this delightful music on 24 steel drums.

Dr. Alan Kolata, visiting assistant curator of Andean archeology, presents an illustrated lecture on "The Lords of Tiwanaku" at 2:00 pm in James Simpson Theatre on the ground floor (at the Museum's West Entrance). He explores the evolution of Tiwanaku, one of the greatest native states of the ancient Americas, located near Lake Titicaca in what is now Bolivia. He details the economic, political, and religious universe of the metropolis of Tiwanaku and the Andean empire it controlled from A.D. 200 to A.D. 1000.

An illustrated lecture on "Fossil Mammals of South America" is offered at 1:00 pm in Lecture Hall I on the Ground Floor (at the Museum's West Entrance) by Dr. Larry Marshall, visiting assistant curator of fossil mammals. South America was an isolated island continent for most of the last 65 million years. The animals evolved there in a world all their own. Meet *Megatherium*, the giant ground sloth, and the armored glyptodont, extinct cousin of today's armadillo. After the lecture, you can see the skeletons of these prehistoric animals on display in Hall 38.

All events are free with admission to the Museum. A detailed schedule (in English and Spanish) is available after January 15. Please send a self-addressed, stamped envelope to receive the advance schedule. Schedules are available at Museum entrances on the day of the event.

This program is partially funded by the Illinois Arts Council.

Egypt
Reju

Hall J, the Museum's world-fa
life with the installation of ne
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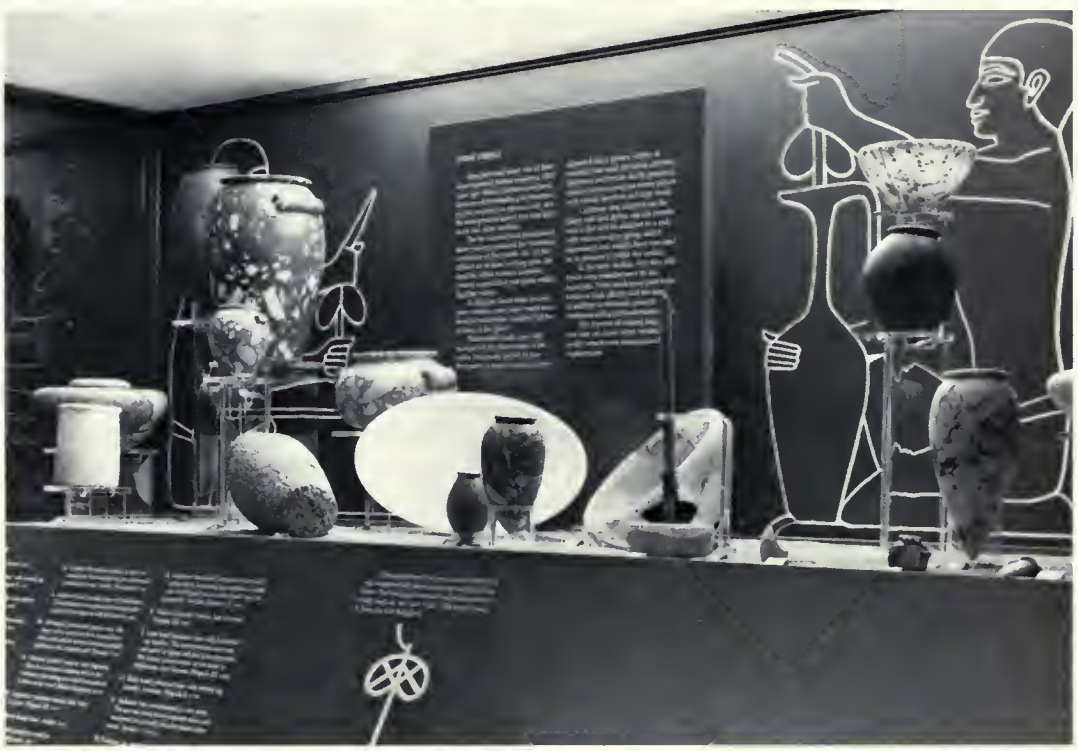
exhibit, and the 'renovation' o
viewers may now appreciate th
arrival of a magnificent, mode
Thebes (on long-term loan from
out the rejuvenation of Hall J
Museum's visitors.

▲ Case 37: *Exhibit of village life and culture.*



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Case 12: *Egyptian p*
pottery-making.
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The tomb chapel o
showing the false d

Hall ated

ian Room," has a new lease on on ancient Egyptian life and Unis-ankh as a walk-through chapel of Netjer-user so that beauty of its interior. And the ica of the tomb of Nakht at olitan Museum of Art) rounds y a great favorite with Field

Photos by D. Walsten

sels made of stone, fashioned.

Two panels of the newly installed replica of the tomb of Nakht at Thebes, with stunning reproductions of the original wall art. ►

Entrance to the tomb chapel of Unis-ankh. Now, for the first time, visitors can walk through this awesome 4,400-year-old structure. ▼

Field Museum Tours for Members

The Ancient Capitals of China

June 6-28

This unique itinerary, rarely granted by the Chinese authorities, includes the most significant sites of early Imperial China and will give an opportunity to explore in depth the civilization which characterized one of the oldest and longest-lived societies on earth. We will have the opportunity to observe the emergence of this remarkable culture and its development to a level which surpassed its contemporaries in the Western World.

June 6: Departure from Chicago to San Francisco in time for evening briefing.

June 7: Departure via Japan Airlines for flight to Tokyo.

June 8: Afternoon arrival in Tokyo; overnight at Nikko Narita Hotel.

June 9: Flight to Peking, where we will spend 4 days, visiting Imperial Palace, Temple of Heaven, Tien-an Square, and the antique shop district; Ming emperor tombs, the Great Wall, the Summer Palace, and the National Museum.

June 13: Overnight train ride to Zhengzhou, capital of Henan Province, where we'll spend 3 days; in addition to sight-seeing, we can rise early to participate in tai chi exercise groups in the People's Park.

June 16: A short train ride takes us east to Kaifeng, where we'll spend 2 days. The city is rarely visited by tourists; it's just at the beginning of modernization, and we'll get a wonderful feeling of Old China.

June 18: Two days in Luoyang, one of the oldest centers of Chinese culture.

June 20: A westward train ride takes us to Xian, our home for 4 days. This is where the fabulous clay horses and warriors of the "Great Bronze Age of China" exhibit were discovered.

June 24: We'll travel by air to Shanghai, where we will spend four days, including a one-day side trip to Souchou, silk-manufacturing center.

June 27: To Tokyo again, for a one-night stay before flying back to the States.

Stanton R. Cook, courtesy Chicago Tribune

Chinese scholar learns his "A-B-Cs."

At a small additional cost, you may stay longer in Japan or in Hawaii, at completion of the China tour.

Our tour leader is Mr. Phillip H. Woodruff, Ph.D. candidate in Chinese history at the University of Chicago. This is Mr. Woodruff's third time as a Field Museum China tour leader and his fourth visit to that country in two years. Cost of the tour is $3,850 (per person, double occupancy).

Alaska Native Culture Tour

June 19-July 1

This 13-day tour begins with a flight from Seattle to Sitka, Alaska, where we will spend two days and nights viewing old Russian settlement buildings, Sheldon Jackson Museum, and National Park Service exhibits. Our third, fourth, and fifth nights will be aboard two yachts, which will take us to Admiralty Island. We will see Tenakee Hot Springs, the native villages of Angoon and Hoonah, and make a tour of Glacier Bay.

Sightseeing in Juneau and its environs will be our activity during the next two days, followed by a day and night in Anchorage and a visit by motorcoach to Denali National Park (formerly McKinley National Park), where we will enjoy the spectacular scenery and view wildlife, spending two nights there. A day and a night in Kotzebue, a day in Nome, and a final day in Anchorage will round out the tour.

All hotel accommodations will be first class; the two yachts will accommodate 16 and 10 persons, respectively. Tour rates to be announced.

Coral Reef Biology and Natural History Explorations In the Western Caribbean

June 22-July 11

The richness of marine life and the beauty of the offshore reefs and islands of Belize and Honduras are unsurpassed in the Atlantic tropics. Field Museum's 20-day tour of this region offers a unique opportunity to explore and study tropical marine and terrestrial ecosystems and, if desired, to earn university credit for doing so. Leading the tour will be three professional marine biologists, each with considerable field work in the Gulf of Honduras and well acquainted with the local flora and fauna.

Included in the tour is a six-day stay at Glovers Reef, 28 miles offshore from Belize. Reef formations at Glovers are among the Caribbean's most richly developed. Lectures and field-trips, including snorkeling, will familiarize participants with the mammals, invertebrates, fishes, sea birds, and in-

Last Call for Baja!

If you are looking for a place in the sun, but want something more than a pretty beach, then come with us for a real adventure. We have just two spaces left for our whale-watching expedition to Baja California scheduled to depart in just a few weeks... February 6.

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

teresting algae of this isolated, untouched coral-reef. Daily scuba diving is available. The 50-foot motor sloop *Christmas Bird* will take us to and from the reef, where we will stay at Lomont's Glovers Reef Village resort.

Our stay at Glovers will be followed by a four-day in-depth exploration of the central Belize mainland, including rain forests, the famed Blue Hole on the Hummingbird Highway, a stay at the Blancanaeux Lodge atop Mountain Pine Ridge, a visit to Rio Frio Cave and the Thousand Foot Falls, and exploration of Mayan ruins at Xunantunich. Aiding us for the four days will be Belize resident Dora Weyer, internationally known naturalist and expert on bird identification.

We will then stay five days at Roatan, one of the Bay Islands, where steep cliffs, rocky shores, and sandy beaches and associated wildlife provide a sharp contrast to the Glovers atoll environment. At Anthony's Key Resort, our Roatan home, first class accommodations, scuba facilities, fantastic sport fishing, tennis, etc., and superlative surroundings will add to our enjoyment. The tour will end with a day at San Pedro Sula, on the mainland, with sight-seeing and shopping or a tour to Mayan ruins at Copan.

Leading the tour will be Dr. Robert Karl Johnson, curator of fishes and chairman of Field Museum's Department of Zoology; Dr. David W. Greenfield, research associate in the Museum's Division of Fishes and professor of biological sciences at Northern Illinois University (NIU), and Dr. Norman A. Engstrom, associate professor of biological sciences at Northern Illinois University. Three semester hours of undergraduate or graduate credit in biological sciences are available from NIU to tour participants. The tour will be limited to 14 participants. Rate to be announced.

Motor sloop Christmas Bird *at Glovers Reef*

Grand Canyon Adventure

May 22-30

An exciting 280-mile cruise down the Colorado River by motorized rubber raft, camping outdoors under the stars. Dr. Bertram Woodland, curator of petrology, will lead the tour. Group limited to 25. Details to be announced.

Galapagos tour cruise ship, M.V. Buccaneer, *in background; shorebird hobnobs with iguanas.*

Ecuador and the Galapagos

March 11-25

The Galapagos Islands affect our imagination like no other place on earth. Field Museum is pleased to offer its members an opportunity to visit this remote archipelago under the expert guidance of Dr. John W. Fitzpatrick, associate curator and head, Division of Birds. If you are a "birder" or a "photographer" this tour is a Utopia.

We'll see 500-pound tortoises, ferocious-looking land iguanas that eat cactus flowers, marine iguanas which are superb divers, penguins, flightless cormorants, colonies of sea lions and fur seals, and many other exotic and unique birds, mammals, and reptiles. The plant life, with 40-foot cacti in coastal deserts and dense rain forests in the mountains, is equally interesting.

In addition to the unique sightseeing and learning opportunities on the cruise, we will spend four nights in Quito, Ecuador, where we'll enjoy old world ambience, along with the color of the centuries-old Indian market and villages of Latacunga and Ambato—we'll overnight in Ambato. Our transfer from Quito to Guayaquil will give us a chance to see the country's remarkable scenery. Special attention will be paid to the unique bird life.

Our cruise ship, the 2,200-ton *M.V. Buccaneer,* meets the highest safety requirements. Originally designed to carry 250 passengers, it was refurbished in the United States in 1976 to carry only 90, and has recently been again refurbished. All cabins are outside and are equipped with complete private bath. The *Buccaneer* offers a comfortable, informal cruising environment. Although we'll be in the tropics, it will never be unpleasantly hot because of the cooling effect of the Humboldt Current.

The price is $3,550 (per person, double occupancy). We hope you will join us in one of the greatest adventures in travel.

Coming up...

Australia Tour

August 23-September 12

Kenya Tour

(with optional extension to Seychelles)

September 11-October 1

Learning Museum continues with

Tribes, Traditions, and Totem Poles: The Northwest Coast Achievement

by ANTHONY PFEIFFER
Project Coordinator

Made possible by a grant from the National Endowment for the Humanities, a federal agency

Civilization has its Seven Wonders, all created by people who practiced agriculture, and all created in the last 10,000 years—less than 1 percent of the time that humanlike creatures have existed. What are the wonders of 99 percent of human evolution? What are the hunting and gathering accomplishments which shaped human-kind? Among the most wondrous of these were the achievements of natives of the Northwest Coast of North America. Northwest Coast cultures were the greatest ever nurtured by hunting and gathering systems — as opposed to agriculture.

It is hard to imagine life without agriculture and domesticated animals. In almost all regions, hunters and gatherers roamed large territories in small bands, taking advantage of the seasonal availability of plants and animals. They knew their lands. Knowledge of what, where, and when foodstuffs could be found was passed on, generation to generation. It was a good life, requiring perhaps eight hours' labor a week to satisfy basic needs, though people had to keep moving in a perpetual restless following of food. They couldn't own more than they could carry. But this pattern of hunting and gathering did not prevail in the Northwest Coast. It was an unusually generous environment.

Top of wooden wand carved to represent a witch spirit. Used by Alaskan Tlingit shaman in ceremony.

Above: *Aleut children pose uncertainly for Field Museum photographer Charles Carpenter at St. Louis, Missouri, Exposition, in 1904.*

Right: *Decaying totem pole at Gitksan, British Columbia, photographed in 1977 by Ron Testa, Field Museum photographer. Does the disintegrating pole symbolize the fate of Native Northwest Coast traditions?*

Below: *Map shows ranges of many of the Northwest Coast tribes discussed in the Learning Museum Program. Artistic heritage of Alaska will be represented by Ronald and Joseph Senungetuk in April 18 Contemporary Arts Symposium; Bill Reid and Robert Davidson will represent the Haidan tradition; Joe David will represent the Nootkan, or West Coast People.*

In 1899, Field Museum zoologist Daniel G. Elliott photographed this deserted Tlingit village of Gash, Cape Fox, Alaska, notable here for its many totem poles.

Temperate rain forests contained an abundance of plant and animal life, rivers teemed with fish, and the adjacent sea hid virtually infinite numbers of shellfish and other edibles. Everywhere one turned there was food, much of it available throughout the year. It was as close to an agricultural lifestyle as one could get by living off the land. Many aspects of social and cultural advancement normally associated with agriculture were developed. Full-time artists, religious practitioners, craftspeople, and other specialists were supported by the wealth of food. Complex systems of tribal government regulated relatively large numbers of people. War was waged.

Lavish resources were not the whole story behind the remarkably advanced Northwest Coast societies. A sophisticated material culture fashioned in a tradition of Stone Age technology was developed to get food and for general living comfort. Woodworking produced everything from totem poles, to homes, to many kinds of canoe. Harpoons were armed with special-purpose tips made of bone or flint, and their shape depended on the kind of quarry being sought. Fish and other meat was smoke-dried for future use.

One would not think that inhabitants of this richly endowed environment had to worry about the future. The coastline stretched 1,000 miles — from southeastern Alaska to the state of Washington, as the crow flies. If one followed the coast as it indented inland or jutted into the sea, it could be considered 12,000 miles long. Stretched along this coast and sandwiched between the sea and a towering mountain range were a bewilderingly diverse group of unique native cultures. Any particular culture might suddenly be struck destitute in spite of nature's normal endowment of plenty. Local rains could fail. The sea could rise up to inundate the villages or recede to turn life-giving beds of shellfish into barren rock. Any number of environmental perturbations could and did periodically transform a hunting-and-gathering paradise into hell-on-earth.

Periodic disasters may have been harder on the Northwest Coast peoples than on other hunters and gatherers. Typical hunters and gatherers simply pack up and leave the scene of trouble. Northwest Coast peoples could not easily move. They had elaborate and permanent homes. They lived in large villages. They were surrounded by other settled neighbors, people who would resist territorial incursions. In short, although they lived by a hunting-and-gathering economy they were tied to

NEH Learning Museum at Field Museum

The NEH Learning Museum program is a three-year sequence of learning opportunities focused on the Museum's outstanding exhibits and collections and designed to give participants an opportunity to explore a subject in depth. Each unit of study consists of one or more special events, a lecture course, and a seminar for advance work. Special events are lectures by renowned authorities or interpretive performances and demonstrations. Course members receive an annotated bibliography, a specially developed guide to pertinent Museum exhibits, and study notes for related special events. In-depth, small group seminars allow more direct contact with faculty and with Museum collections.

an area for better or for worse. Some scientists think that religious gatherings as well as extensive trade networks up and down the coast protected against local disasters. Such ceremonies served to distribute food and wealth from the haves to the have-nots. Whether or not the dramatic rituals can be explained so functionally, it is clear that science is just beginning to understand the dynamics of a system that has radically changed.

Much of the material grandeur of the Native Northwest Coast has endured to this day. Field Museum garnered many spectacular artifacts in the late 1800s and the early 1900s. Since these times the Museum has been renowned for the quality of its Northwest Coast collections. This spring, after dozens of people have worked for nearly five years at a cost of millions of dollars, Field Museum's newest permanent exhibition, "Maritime Peoples of the Arctic and Northwest Coast," opens. The Learning Museum course—*Tribes, Traditions, and Totem Poles*—is offered as a prelude to this historic opening.

Tribes, Traditions, and Totem Poles explores the origins and flourishing of Northwest Coast cultures. Archeological evidence and native traditions are juxtaposed to shed light on where the peoples came from and when. Varied coastal habitats are discussed and the seemingly lush uniformity is broken into distinct ecological zones, each posing different challenges for human settlers. The technologies of survival and art are shown. Trading, raiding, and huge feasts are seen as adaptations to a changing environment. Family life, day-to-day society, and activities involving the whole tribe are discussed. Finally, shamans, secret societies, supernatural presences, and the spiritual side of coastal life are explored. Details of the course are available in the Winter, 1982 *Courses for Adults* brochure.

In conjunction with studying Northwest Coast peoples, Members and nonmembers alike are invited to attend a Symposium on Contemporary Arts, April 18, 1982. "Echoes of the Past, Tides of Change" presents four artists who have rescued their respective heritage and are taking them forward. Their work is guided by the past but not determined by it. Robert Davidson, for example, has expanded the boundaries of Haida style by using circular, as opposed to boxlike, forms, and through other innovations. The artists discuss not only their unique contributions but the future of the arts as well. As Bill Reid, moderator, puts the issue, "just because a few people are doing second-rate silkscreens doesn't mean the old traditions are alive." Is the resurgence of Northwest Coast art a renaissance or is it a fleeting moment based on the work of just a few? Are we seeing a rebirth or slow death? Details of the symposium are featured in the April *Calendar of Events*. □

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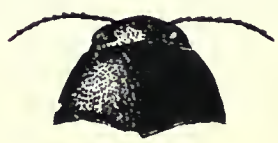


Letters from the Arctic—I

By EDWARD OLSEN
Curator of Mineralogy

Photos courtesy of the author

Hindsight is a marvelous teacher. Once we know something is possible it becomes easy to say why it is so and to go on to make predictions. Such is the state of things for those of us who search this planet for meteorites.

Over the past twelve years something like 6,000 meteorite fragments have been recovered from the ice cap of east Antarctica. Once the phenomenon of Antarctic meteorite concentrations was discovered accidentally by the Japanese, hindsight came into action and it was obvious why meteorites were there in such quantities in the first place.

When a meteorite lands in a place like an Illinois prairie, for example, it finds itself in a (chemically) hostile environment. The ambient air contains two deadly chemicals—oxygen and water. The meteorite came from deep space, where both of these are utterly absent. The minerals that make up the meteorite begin to oxidize, or rust, from reaction with oxygen. This reaction proceeds more rapidly in warm weather than in cold. Then during the warm months, moisture slowly creeps into the minute pore spaces along mineral grain boundaries that permeate the meteorite. Rains soak in. Winter comes and, as we all know, when water freezes it expands. A bottle of water sitting outside in freezing weather cracks into pieces. The same thing happens to the meteorite—small cracks are opened and chips flake off due to the cracking action of ice. Each year the cracks get larger, until the meteorite falls to pieces. In addition, soils in which fallen meteorites find themselves are full of bacteria and decaying vegetation, both of which release complex acids. These corrode minerals in the meteorite, aiding the process of weathering. In a few years, the meteorite

Edward Olsen (right) with party members on Devon Island ice-cap. From left: *Blyth Robertson, Les Coleman, Steve Kissin, and Olsen. In the search helicopter is pilot Lin Hoe.*

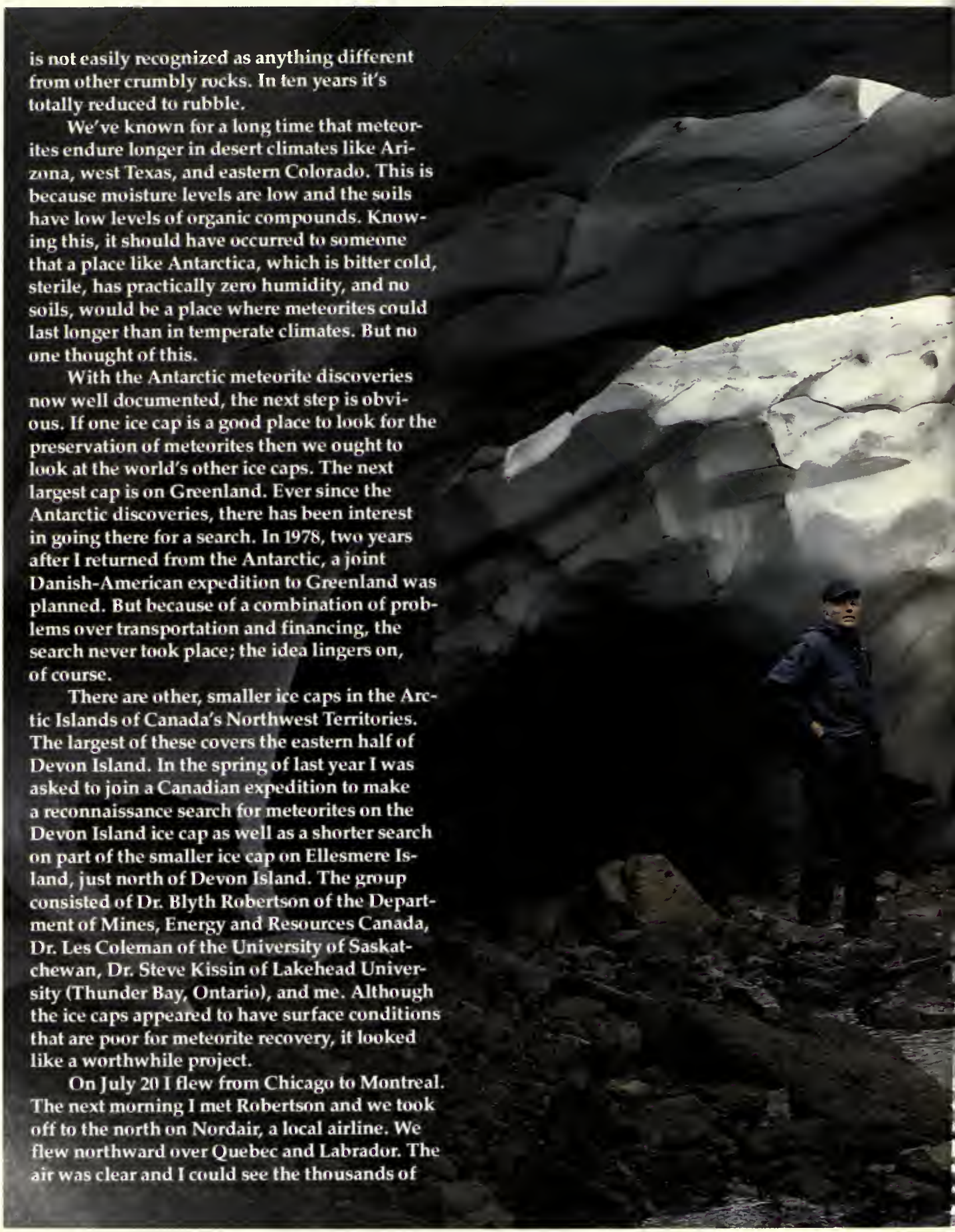
is not easily recognized as anything different from other crumbly rocks. In ten years it's totally reduced to rubble.

We've known for a long time that meteorites endure longer in desert climates like Arizona, west Texas, and eastern Colorado. This is because moisture levels are low and the soils have low levels of organic compounds. Knowing this, it should have occurred to someone that a place like Antarctica, which is bitter cold, sterile, has practically zero humidity, and no soils, would be a place where meteorites could last longer than in temperate climates. But no one thought of this.

With the Antarctic meteorite discoveries now well documented, the next step is obvious. If one ice cap is a good place to look for the preservation of meteorites then we ought to look at the world's other ice caps. The next largest cap is on Greenland. Ever since the Antarctic discoveries, there has been interest in going there for a search. In 1978, two years after I returned from the Antarctic, a joint Danish-American expedition to Greenland was planned. But because of a combination of problems over transportation and financing, the search never took place; the idea lingers on, of course.

There are other, smaller ice caps in the Arctic Islands of Canada's Northwest Territories. The largest of these covers the eastern half of Devon Island. In the spring of last year I was asked to join a Canadian expedition to make a reconnaissance search for meteorites on the Devon Island ice cap as well as a shorter search on part of the smaller ice cap on Ellesmere Island, just north of Devon Island. The group consisted of Dr. Blyth Robertson of the Department of Mines, Energy and Resources Canada, Dr. Les Coleman of the University of Saskatchewan, Dr. Steve Kissin of Lakehead University (Thunder Bay, Ontario), and me. Although the ice caps appeared to have surface conditions that are poor for meteorite recovery, it looked like a worthwhile project.

On July 20 I flew from Chicago to Montreal. The next morning I met Robertson and we took off to the north on Nordair, a local airline. We flew northward over Quebec and Labrador. The air was clear and I could see the thousands of



lakes that dot the interior of Labrador. I thought of the five years I had worked down there, years and years ago, doing geological mapping around those lakes. Soon the treeline was passed and we were flying over barren lands. Over Hudson's Straits we could see our first icebergs. We made a forty-minute stopover at Frobisher Bay, on Baffin Island, to drop off some of the passengers, then flew on to an airfield at Resolute Bay, on Cornwallis Island, one of the Arctic islands just to the west of Devon Island.

At Resolute we stayed in barracks that are operated by the Canadian government for arctic research parties. The barracks are trim wooden buildings with sleeping rooms, toilet and laundry facilities, and a dining room operated by a smiling Eskimo woman and her pretty teenage daughter. The next day we were joined by the other party members who flew in by way of Edmonton, Alberta.

The first day was sunny and fairly warm; however, for two days the weather was dark and windy with snow squalls. While waiting for transportation to Devon Island we hiked to one coast of Cornwallis Island to visit a cluster of ancient Eskimo ruins—a Thule culture site. Long ago a small group of these people built houses (igloos) of flagstone walls. Whale ribs over the top held skins and sod blocks for roofs. Now only stone rings and a tumble of whale bones remain next to a shoreline of stranded icebergs and floating sea ice.

On July 24 the weather improved and we took off from Resolute Bay aboard a Twin Otter aircraft. We flew to Truelove Inlet, named after a whaling ship, the *Truelove,* that overwintered there a long time ago. At Truelove there is a camp consisting of five quonset-type huts. Here was a party of five biologists making a survey of arctic birds. Over fifty bird species visit this area, many of them nesting here. The most common are snow buntings, old-squaw ducks, and Baird's sandpipers, but there are abundant species too, like red-throated loons, golden plovers, knots and even the occasional raven.

It is interesting that in these polar islands birds from Europe and North America converge. They intermingle in the summer months,

Edward Olsen standing by meltwater stream in ice cave, Devon Island.

Nodding, or bulblet, saxifrage (Saxifraga cornua) *on Truelove lowland, Devon Island.*

nest, raise young, then depart in late August southward down their separate migration paths, ending up in Spain, North Africa, etc., or the United States and the Gulf of Mexico. The birdwatching was excellent at Truelove, as was the display of a wide variety of flowering plants —all small alpine types—in yellow, red, purple, and blue. I didn't realize it at the time, but the Truelove lowland is a kind of environment that is not too widespread on Devon Island. Most of the island is an elevated plateau with almost no vegetation, no soil, and no birds.

The party of five biologists doing the survey consisted of two graduate students: Jody Butler of the University of British Columbia and Galen Pittman from the University of Kansas; a Canadian government biologist, Al Smith from Ottawa; and two faculty members from the Northern Alberta Institute of Technology, Rod Moore and Don Pattie. Don is the man principally responsible for the presence of the facilities at Truelove. Through his affiliation with the Arctic Institute of North America he has, over a period of eleven years, built up the station to what it is today. Among the buildings are three sleeping quarters, a repair shop, a cook house, and an airstrip. Don has surveyed the bird populations on the Truelove lowland for a decade, measuring increases and decreases in species. His total count of all species for a summer ranges from about 1,100 to 1,700 individuals. With such low populations it is undesirable to collect birds. Don noted that the first surveys of arctic birds were made by ornithologists with guns, who shot and collected specimens. This resulted in the near elimination of some species; but now with a decade of no shooting, these species have increased their nesting numbers in this region.

To reach the ice cap for our meteorite search we would need a helicopter. The cap lay only 18 miles away; however, a river and two large scarps, or cliffs, together almost 2,000 feet high, lay between us and the ice. Although the weather at Truelove was good, at Resolute it was terrible and a helicopter couldn't be sent. On top of it all, a burst of sunspot activity ruined radio communication for a day and some aircraft flights were restricted. Resolute is only a short distance from the north magnetic pole. Sunspot activity is more disturbing to communications in this area because of that.

We had some time on our hands while waiting for the helicopter. We spent a little time getting used to our rifles and shotguns. The arctic's first citizen is the polar bear and in some years they can be numerous. In 1980 nine were seen near Truelove. Guns are required for peace of mind more than anything else. Few bears are

Moraine area of valley glaciers on Ellesmere Island; Blyth Robertson at right.

ever actually shot, and none of us had any desire to do so.

We took some long hikes over the tundra and into the adjoining hills. The Truelove lowland is in front of a series of mesa-like ridges of flat-lying Cambrian sedimentary rocks. A giant fault scarp runs east-west a few miles south of camp, exposing pre-Cambrian granites along the base of a 1,000-foot cliff. The scenery is stark, barren, and impressive. Hiking the lowland, we encountered herds of grazing shaggy muskoxen. At one place a small herd, consisting of a bull, two calves, and five cows, stood their ground before us in true muskox fashion, forming a line in front of their young with heads lowered and horns aimed at us. I walked within 35 feet of them, and although they shuffled about they stood fast, the bull snorting at me, honing one of his horns against his foreleg. If the bull were alone he would have made short charges at me, but with calves present he stayed with them. Standing close by you can easily feel a real affection for them; they are great mounds of fur that hang to the ground and blow in the wind. They are basically gentle creatures that seem to want only to be left alone. This group finally broke and thundered off over the tundra towards a nearby low ridge.

Across the tundra you can find places where muskoxen have shed mats of hair. A small ball of it, loosely cupped in the hand, will cause your palm to become very warm. Its insulating qualities are so good that the heat from your hand builds up and little is lost.

We continued our hike to a broad, rocky valley with a roaring glacial stream criss-crossing its floor. At one point a magnificent waterfall was seen pouring over a notch in the scarp, in a series of cascades. As we climbed over a high ridge we could see the icecap in the distance, high above the valley wall, gleaming white in the sunlight. The weather was improving.

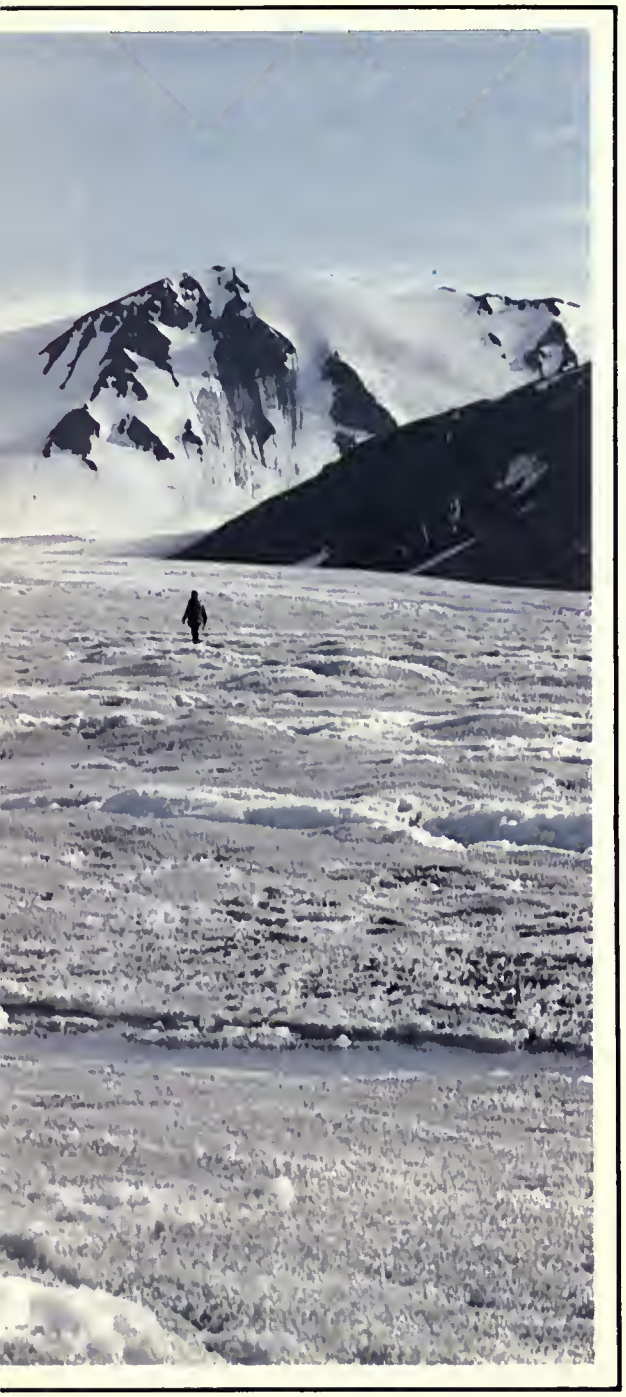
The next day the helicopter arrived with a pilot and a mechanic. We flew to the ice cap as the weather began to go bad again. Part of our group was set down to traverse a moraine of rock that lay strewn on the ice. Steve and I flew northward along the cap to do the same at any other rock showings. We set down at another moraine and then hiked about four miles to some

Above: *Surface of icecap, Ellesmere Island. Meltwater river meanders across foreground.* Far right: *Muskoxen arrange themselves in characteristic defensive pose. Truelove lowland, Devon Island.*

isolated rocks that we could see through binoculars high up on the top of the ice slopes. All the rocks in this area were granites of several kinds. I got a special, personal thrill out of this trek, for I had now hiked on all three of the world's largest continental ice caps — Antarctica, Devon Island, and (exactly 30 years earlier) Greenland.

The weather was getting terrible. Low clouds rolled past at surface levels, obscuring the view in several directions. Snow squalls swirled by. The ice surface was cut by melt-water rivulets, and walking required constant probing with an ice axe handle to see if we were going to break through small crevasses. We finally found our way back to the helicopter and took off. Finding the other part of our party wasn't easy in the snowstorm. I began to get worried that we'd have to return to Truelove without them until the weather improved. A small break in the clouds, at the right time, revealed a tiny figure plodding through the snow below us. We set down and picked them up. We flew back to Truelove to wait out the weather.

The next day the weather continued to be bad. The ice cap had black clouds rolling over its surface; however, by about 8 p.m. it cleared and was bright and sunny over the cap. With 24 hours of daylight, work can go on when the weather is good rather than by the clock. So we packed our gear and took off in the helicopter.



We cruised the ice cap at 1-3 mph, setting down near any rocks showing on the surface. By about 3 a.m. we had covered the entire portion of the ice cap that we had planned to search. No meteorites!

We sailed down a huge valley glacier, the Sverdrup Glacier, between vertical walls of granite, and emerged out over the Arctic Ocean—a magnificent flight experience. We followed the coastline back to Truelove Inlet, counting 105 muskoxen, in herds up to 14 individuals, along our course. The scenery was spectacular in the light of the low-hanging sun. When we landed back in camp we flushed a group of arctic foxes.

Although our expectations for meteorite recoveries on Devon Island were never high, we were all disappointed at not finding at least one. Theoretical calculations indicated between 1,500 and 3,000 meteorite fragments would be there, potentially. We knew ahead of time, from aerial photographs, that the ice cap had a heavy snow cover at any given time, and was very different from the Antarctic ice cap, which has bare blue ice, little snow cover, roaring winds, and no melting. The main hope of finding any meteorites on Devon Island was the chance some portion of the ice cap would be windswept and clear of snow, exposing the old ice beneath it. We found no such areas.

The next day a Twin Otter aircraft arrived from Resolute and took our party north, across the sea, to an Eskimo village at Grise Fjord on Ellesmere Island. Shortly afterward our helicopter arrived, and while it was refueling, we had a chance to go into the Eskimo Cooperative trading post, where I bought a soapstone carving.

We took off and headed eastward across the ocean to a large headland, where we turned north and flew up a glacier-filled valley, over a height of jagged mountains and into a valley of spectacular arctic beauty. It was a place on the Ellesmere ice cap where eight valley glaciers flowed into a depression with no outlet. When the expedition to Devon Island was originally planned, a Canadian glacier expert had suggested we might also look at this place on Ellesmere.

It is an extraordinary situation, glaciologically, to have so many valley glaciers pushing into a central depression. It was thought that perhaps, among the accumulated rock debris of all these glaciers carried into this spot from surrounding areas of several thousand square miles, there might be some concentration of meteorites. Our hopes were never high for this area because we knew that there would be vast amounts of rocks from the surrounding mountains that would make it almost impossible to notice any meteorites among them. That is exactly how it worked out. The depression was a jumble of

The stark, lonely beauty of the arctic is captured in Olsen's shot of stranded icebergs on Cornwallis Island coast, near Resolute Bay.

granites and other terrestrial rocks. We climbed onto one of the largest glaciers and walked across it for miles on the chance some meteorite might be on the surface. We found no rocks at all. Across the surface of the ice ran a huge meltwater river—icy water cutting into pure ice. The channel was deep blue in color and utterly clear and clean. The water coursed swiftly, swinging along deeply cut meanders, almost completely silent.

We flew back to Grise Fjord, refuelled, then flew across the sea to Devon Island and Truelove Inlet. While cruising over the sea ice we saw our first polar bear—a huge white fellow, who was obviously upset by the sound and whoosh of air from the helicopter. He dove into a pond of meltwater on the ice surface, then raced off across the ice as we followed him. We circled him at low elevation and he finally sat down and looked up at us in confusion. We left him in peace.

The next day a Twin Otter flew us to Resolute Bay, and Les and Steve departed for home. I was to spend more time back on Devon Island collecting samples from an ancient meteorite impact crater on the western, unglaciated end of the island.

The meteorite search on the Devon Island ice cap did have a yield of information, if not of meteorites. Ice caps in arctic regions are too snow covered to be good search areas for meteorites. The Antarctic ice cap is much colder; virtually no melting takes place there at any time of the year, and most of the ice accumulates on the surface by direct condensation of small amounts of moisture in the air, rather than by snowing, as it does in the arctic. These differences are due to several factors. The Antarctic continent sits alone over the south pole and is surrounded by open oceans that have no effect on altering the circumpolar weather pattern. The ice caps in the arctic, Devon and Greenland, are in subpolar positions and have many land masses nearby to break up the circumpolar weather pattern. The arctic is warmer as a result, and the ice surfaces are different. From the Devon Island search we learned that a search of Greenland, too, may not yield new meteorite finds. □

OUR ENVIRONMENT

Radio Beacon Leads Investigators to Bald Eagle Burial Site

"He that has patience may compass anything," the 16th-century French satirist Rabelais wrote. "Patience," in both the literal and figurative sense, coupled with some sophisticated 20th-century technology, led U.S. Fish and Wildlife Service investigators recently to the conclusion of an unusual case involving the death of an endangered bald eagle.

A matchbox-sized radio transmitter emitting a prolonged rapid-pulse "distress" signal off the tail of a bald eagle nicknamed "Patience" led airborne biologists to a 50-acre island in Oregon's Snake River, where they uncovered the eagle's burial site.

Their discovery, after three months of charting the research bird's elusive migration path through the intermountain west, led to an inquiry by Fish and Wildlife Service law enforcement agents. Charged with the shooting of the endangered bald eagle was an Oregon rancher, who had tossed its carcass into the island's garbage dump last January. There, its miniature radio device continued to emit a staccato pulse that led its trackers ever closer to the scene of the bird's abrupt end.

In July, after a lengthy investigation during which the Oregon man confessed to the shooting, the Federal Court in Portland, Oregon, ordered the rancher to pay a $2,500 fine under a settlement with the U.S. Attorney's office. One-half of the fine will be turned over to Glacier National Park's Bald Eagle Research Project to fund further research. The rancher received the fine and a 30-day suspended jail sentence for violating the Bald Eagle Protection Act.

"Patience," a three-year-old female that had not yet acquired the "bald" head of white feathers distinctive for mature five-year-old birds, became a research subject in the McDonald Creek section of Glacier Park. There, researchers captured the bird, attached the tiny radio transmitter and identification markers, and released it. In a program cosponsored by the National Park Service and the University of Montana and supported by the National Audubon Society and the Wildlife Management Institute, the scientists are studying the migration patterns of the birds, which are officially listed as "endangered" in 43 states and "threatened" in five others. (In Alaska, the species is not in such danger, however.)

An estimated 10 percent of the bald eagles known to winter in the United States pass through Glacier each fall. At times, their concentration in McDonald Creek can range as high as 600 birds. In 1980, researchers began equipping the birds with radio transmitters in an effort to reveal the eagles' winter migration routes farther south and their return routes to summer nesting grounds in Canada, with an eye towards developing a management plan for crucial roosting and feeding sites along their path.

"Patience" remained in the vicinity of Glacier Park and nearby Flathead Lake until December, 1980, when it departed on a migration of more than 500 miles along Idaho's Bitterroot Mountains and the middle fork of the Salmon River. This was the first time that researchers were able to fully track a research bird's westerly migration, in contrast to the more southerly migration route taken by most of Glacier's eagles.

Harriet Allen, a Bald Eagle Research Project biologist, tracked the bird for most of its journey, driving more than 6,000 miles on mountain roads as she followed the flight path. Somewhere along the Snake River near Ontario, Oregon, "Patience's" radio signals were lost. Allen reestablished contact during two flights over the river, but an unchanging series of "fast pulse" radio signals told her the bird was possibly in trouble.

Allen pinpointed Old Crow Island, about two miles south of Ontario, where she had sighted the bird on one instance the week before, as the site of the distress signals. The island, in the middle of the Snake River, is owned by the state of Oregon and leased for farming and grazing. There, under a foot of rubbish covered with a sheet of metal, Allen and state biologists found "Patience," its orange wing markers torn off but its radio transmitter still attached and operating. X-rays revealed that the bird had been struck in the head by a shotgun pellet.

"I felt a tremendous sense of loss, as did everyone on the project," Allen said. "There was much more we could have learned from this bird. But it was one of the few instances when we could fully piece together the details of one of the many eagle shootings in the West."

The Fish and Wildlife Service estimates that up to 200 bald and golden eagles may be killed in the Pacific Northwest each year by gunners who illegally shoot raptors, by suppliers of the illicit trade in eagle feathers and related items, and by people who set baited traps for other wildlife and accidentally snare eagles.

The service began an investigation into the eagle's death by interviewing a nearby landowner who raises livestock and poultry on Old Crow Island. He confessed to the shooting, claiming that he thought the bird was a hawk that posed a threat to his livestock.

Under the Bald Eagle Protection Act, bald and golden eagles are protected and, except under limited circumstances, their killing, possession, and trade is illegal, with penalties of up to one year in jail and a fine of $5,000 for first offenses. (The bald eagle is also protected under the Endangered Species Act and, in addition to hawks and other birds, is protected by the Migratory Bird Treaty Act.)

Painting Town Red Passé?

Incredible though it may sound, a French artist, Jean Verame, is currently spray-painting the mountains in the previously untouched valley of Bir Nafach, an area close to the historically sacred Mount Sinai, with 13 tons of black and blue paint. Boulders, peaks, and rock walls are now literally black and blue in polka-dots, triangles, and squares.

The artist calls it "adding a human dimension to nature"; conservationists call it "vandalism." The natural desert sandstone hues of the mountains of southern Sinai will bear Verame's imprint for many years.

Killer Deer

You think that cuddly fawn you picked up and raised by hand would never harm a soul? Think again.

Kim Heller, a photographer with Ohio Department of Natural Resources, died from wounds suffered when he was gored by a deer. Heller was on assignment for the department at a private wildlife preserve when a semidomesticated white-tailed deer charged and gored him in the chest and abdomen.

Cut and bruised, Heller managed to crawl into a nearby pond and escape the deer. Later, he was able to make his way to his vehicle and drive to the home of the preserve manager for help. But he died five days later in a hospital.

The attack on Heller is not a rare type of incident. There are many reports of "tame" deer kicking, goring, or otherwise inflicting injury on their "owners" or others.

EDITH FLEMING
946 PLEASANT
OAK PARK ILL 60302

January & February at Field Museum

January 16 through February 15

Continuing Exhibits

"In the Shadow of the Pyramid." A newly designed section of the Egyptian Collection, Hall J, presents prehistoric and early historic exhibits in proper context. Visitors can walk through the tomb chapel of an Egyptian nobleman, Unis-ankh, and view afterlife offerings in another tomb through a glass wall. Outside the south entrance to the Egyptian Room a replica of the Tomb Chapel of Nakht, on loan from the Metropolitan Museum of Art, has been installed. The chapel walls are covered with reproductions of some of the finest known Egyptian tomb paintings.

Indians of Middle America. Aztec stone sculptures are a highlight of this exhibit, focusing on Middle American cultures, 1500 B.C. to the present. In addition to costumes, pottery, and farm tools, you'll see dioramas of an Aztec marketplace and of a Maya ceremony, as well as a canoe of modern-day Cuna Indians. Hall 8, main floor.

New Programs

Winter Fun. Children in various age groups are invited to join a natural history workshop during January. Each project will be for one or two Saturday sessions. Call 322-8854 for a brochure with more information and prices.

☐ January 16: 10 a.m.–12 noon.
"Arctic Journey." A craft project, making a mini-igloo, weather permitting; ages 4 and 5.
"Costumes for the Sorcerer's Dance." Continuation of Jan. 9 workshop.
"Metal Casting." Craft project and tour; ages 9–12.

☐ January 16: 1 p.m.–3 p.m.
"Different Faces from Faraway Places." Continuation of Jan. 9 workshop.
"Indian Drums." Craft project and tour of Pawnee Earth Lodge; ages 6–8.
"Metal Casting." Craft project and tour; ages 9–12.

☐ January 23: 10 a.m.–12 noon.
"Arctic Whales." Stories, songs, and slide program; ages 4 and 5.
"Reptile Tales." Demonstration and tour; ages 6–8.
"Our Feathered Friends." Craft project and tour; ages 9–12.

☐ January 23: 1 p.m.–3 p.m.
"People of Clay." Craft project and tour; ages 6–8. Continued Jan. 30.
"The Secret Life of Salamanders." Craft project and tour; ages 6–8.
"The Invisible World." Microscopic demonstration and experiment; ages 6–8.

☐ January 30: 10 a.m.–12 noon.
"The Corn Maiden's Feast." Craft project and tour; ages 4–5.
"The Chinese Shadow Play." Craft project culminates in a shadow play; ages 6–8.
"Marine Fossils." Demonstration and tour; ages 9–12.

☐ January 30: 1 p.m.–3 p.m.
"Crickets, Kites and Kids: Village Life in China." Craft project and tour; ages 4 and 5.
"The Primates: Our First Cousins." Tour and demonstration; ages 6–8.
"People of Clay." Continuation of Jan. 23 workshop.

Latin American Neighbors Day. A fiesta of events will acquaint Chicagoans with Spanish-speaking Americans. Dances, tours, lectures, touchable exhibits, craft projects, and games from the cultures of Mexico, Central and South America will be featured. Special programs for children, in Spanish and English. All events free with Museum admission. Sunday, Jan. 31, 12 noon to 4 p.m. Highlights include:
☐ "Nuevo Ideal." Mexican folk dances will be performed in Stanley Field Hall at 1:30 and 3:30 p.m.
☐ "Lords of Tiwanaku." Dr. Alan Kolata, visiting assistant curator of Andean Archeology, will present an illustrated lecture on the history and evolution of Tiwanaku, one of the great civilizations of the ancient Americas; 2 p.m. in Simpson Theatre.
☐ "Fossil Mammals of South America." Dr. Larry Marshall, assistant curator of fossil mammals, will introduce some of the strange mammals that evolved in South America during the millions of years that it was an isolated island continent; 1 p.m. in Lecture Hall I.
☐ The Clemente Steel Band of Roberto Clemente High School will perform at 2:45 p.m. in Stanley Field Hall.

Winter Journey. "The Adventures of Marco Polo." In this self-guided tour, visitors observe animals that Marco Polo saw on his travels and read his own descriptions of them. Free *Journey* pamphlets available at Museum entrances.

Weekend Discovery Programs. Tours, craft projects, slide presentations, and films which use exhibits as a springboard for new insights into natural history topics. The January "Film Features," focusing on ancient China, will be shown every Saturday at 1:30 p.m. in Lecture Hall I; free with Museum admission. Check *Weekend Sheet* at Museum entrances for other programs. Coming February 21. "Hidden Valleys of Tibetan Myth and Legend." Lecture by Edwin Bernbaum, author of *The Way to Shambhala.*

Continuing Programs

Volunteer Opportunities. Persons with scientific interests and backgrounds are needed to work in various departments. Call the Volunteer Coordinator, 922-9410, ext. 360.

January and February Hours. The Museum is open from 9 a.m.–4 p.m., Monday–Thursday; 9 a.m.–9 p.m., Friday; and 9 a.m.–5 p.m., Saturday and Sunday.

The Museum Library is open weekdays, 9 a.m. to 4 p.m. Obtain a pass at the reception desk, main floor.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

February 1982

Field Museum of Natural History Bulletin

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Winter Afternoon at Lake Michigan Dunes. Photo by John Kolar.

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FIELD BRIEFS

D. Walsten

Field Museum's new Mary W. Runnells Rare Book Room, viewed through display window. Funding for the new facility, opened December 2, was provided by Mr. and Mrs. John S. Runnells. The opening of the Rare Book Room and of the renovated Library Reading Room was celebrated with a luncheon and tour of the facilities, sponsored by the Women's Board of Field Museum.

The Planned Giving Program

All their working lives, the married couple had wanted to make a substantial gift to Field Museum. Soon after his wife's death, the husband realized that now, having no heirs, was the time to make that gift, and that his wife would want it this way. Therefore, he transferred a substantial securities portfolio into the Field Museum Pooled Income Fund.

In making the gift in this manner, this individual will receive a lifetime income through the Fund; morever, he has freed himself from financial concerns, with his funds now receiving professional management. His income, incidentally, will reflect a higher yield than his original portfolio, because he had been "locked in" to low-yielding, but highly appreciated, securities. By making the transfer, he avoided recognizing the capital gains, and, therefore, avoided any capital gains tax; yet, he was able to get an immediate charitable tax deduction on a portion of those funds.

Another person, anxious to help a friend, this past Christmas transferred funds into the Pooled Income Fund sufficient to give the friend a generous monthly income, for life. This donor also received a charitable income tax deduction and was freed from any capital gains tax.

These are two examples of types of gifts that have been made to Field Museum's Pooled Income Fund since inauguration of the Museum's Planned Giving Program this past September (see the September *Bulletin*).

The Pooled Income Fund is a convenient way to assure having a life income and to make a significant gift to the Museum at the same time. It is the exception to the adage, "you can't have it both ways!" Gifts to the Pooled Income Fund pass to the Museum's Endowment Fund at the conclusion of the final life interest.

Since announcement of the Museum's Planned Giving Program, the Museum has been informed by many Museum friends that they have remembered Field Museum in their wills. This past fall, a survey of the Membership was taken, to find those persons, and to interest others. The survey had gratifying results, and any Member who has not yet responded is urged to do so.

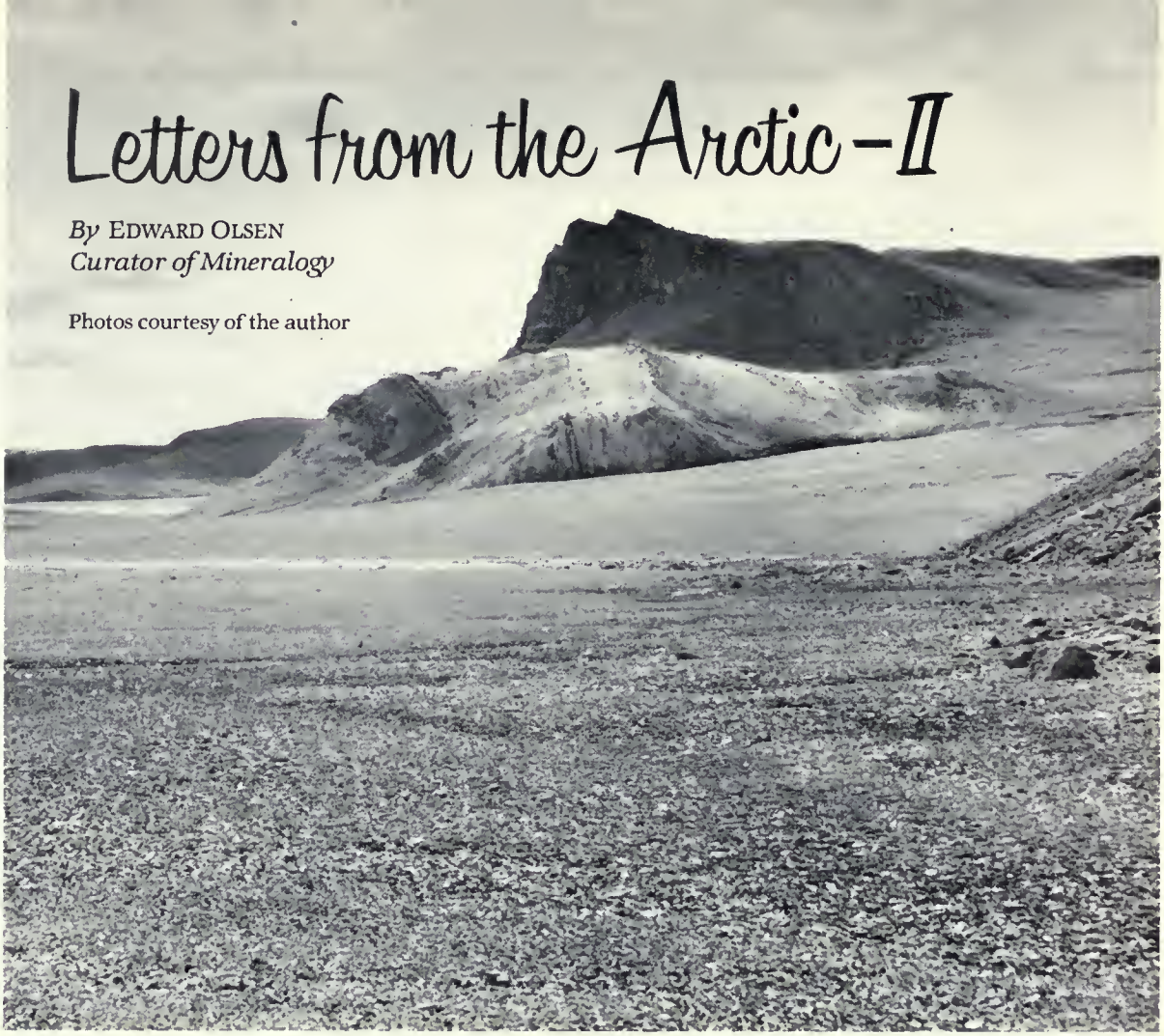
Purpose of the Planned Giving Program is to increase the Museum's endowment. Bequests by will and gifts through life income trust agreements go into the Endowment Fund, perpetuating

Continued on page 27

Letters from the Arctic—II

By EDWARD OLSEN
Curator of Mineralogy

Photos courtesy of the author



Sedimentary rock outcrops, tipped vertical by asteroid impact 15 million years ago, are still coated with pale rock dust created by the impact.

In 1955, or thereabouts, the first detailed geological maps were made of many of the arctic islands of northern Canada. On Devon Island the geological features were pretty straightforward: granitic rocks of the deeper crust are exposed on the eastern half of the island, and these are overlain with sedimentary rocks (of Paleozoic age) on the western half.

In the western half, however, a peculiar geological structure was observed. This was a 20 km (12 mile) circular structure consisting of discontinuous rings of rock layers tipped upward, very much broken up by fractures and faults, and coated with pale gray pulverized rock that contains chips and fragments of all the kinds of rock types represented in the area.

The geologists who first mapped this odd structure were perplexed. It is somewhat similar to a structure known as a salt dome—so, having to call it something, that is how they designated it on the map. It remained that way for sixteen years, when another geologist, Dr. Mike Dence of the Department of Energy, Mines and Resources Canada, looking over the geological maps of the arctic islands, noticed that it was all by itself on Devon Island; the nearest other known salt dome was over 500 km (about 300 miles) away on another arctic island. Since salt domes are sedimentary rock structures that almost always occur in clusters, not as singles, Dence thought the solitary nature of the Devon Island "salt dome" really odd. Besides, he compared the position of the structure with the height contours of a topographic map that existed for the region and found that it consisted of a slight depression. It occurred to him then that the structure might really be an ancient scar from a huge meteorite impact explosion.

In 1975 Dr. Blyth Robertson, also of the Department of Mines, Energy and Resources Canada, met a mining company geologist who was going up to the area. Robertson asked him to collect some sample rocks, especially anything that looked unusual. In due course he received from him a group of samples that were clearly recognizable as evidence of an impact explosion—shatter cones.

Shatter cones are just what their name implies, cones formed by the shattering of the rock from which they are made. Many of us have had the experience of having our car windshield struck by a pebble flying up from the wheel of a passing car. The common form of damage is a tiny hole on the outside surface, with a small

The first segment of Edward Olsen's 1981 visit to the Canadian Arctic was recounted in "Letters from the Arctic — I," in the January, 1982, Bulletin.

cone-shaped chip popped out of the inside surface. The pointed end of the cone aims at the source of the impacting pebble.

For about 25 years it has been recognized that very large meteorite impact craters have shatter cones developed in the rocks that surround their centers. These take the form of typical cones with unique, characteristic flutings on their surfaces. It has been found that if the direction of the pointed ends—as seen in outcrops of the blasted, contorted rocks—are mapped, and if the original position of horizontal layers is taken into account, the points all aim radially toward a single, central point—the point of impact: "ground zero."

In 1977 Robertson spent part of the arctic summer at the site, collecting shatter cones, mapping their positions, and doing a survey of the gravity field over the structure. When a portion of the earth's surface has suffered a crushing blast, the shattered rock has more pore space than the original rock, due to the fractures that form between and through the mineral grains that comprise it. As a result, crushed rock under an area will cause the pull of gravity to be very slightly less than in surrounding areas where the bedrock is uncrushed. The result of this survey showed just such a gravity feature: a circle of 20 km that coincided with the geological structure and with the slight topographic depression. All this, combined with the shatter cones and the discovery of a form of quartz in the rock that is known to crystallize only at very high shock pressures, made the story conclusive. The structure is definitely an impact crater.

Subsequent study has shown that the impact occurred 15 million years ago, and the original crater has been largely filled by sediments of a lake that once occupied it—which is why the depression is only slight today. The impacting object was about 1 km in diameter (more than 3,000 feet). It vaporized completely on impact.

When a small meteorite, less than about 100 tons, hits the earth, it merely punches a hole into the soil and usually breaks into fragments itself. When a meteorite of 100 tons or more hits, the energy is too high for the meteorite to hold itself together. The energy is literally greater than the energy that binds atom to atom in the minerals that comprise the meteorite. It vaporizes as an explosive cloud, excavating millions of tons of the rock at ground zero, uplifting layered rocks next to the explosion, and sending a shock wave through the surrounding area, causing shatter cones to form. If the blast is below a certain magnitude a simple, hollowed-out crater is developed. An example of that kind of crater is Meteor Crater near Flagstaff, Arizona. If the explosion is above a certain magnitude a complex crater develops: the central part is excavated in the blast and immediately afterward the earth under the center rebounds, forming a small peak. Such craters are common on the lunar surface. The central peak is analogous to the blip of water that spurts upward when a pebble is dropped into standing water. The crater on Devon Island is one of these. The central portion has been uplifted into a small peak just after the impact explosion. In the 15

Limestone shatter cone formed by severe shock waves from asteroid impact.

*Ground willow (*Salix *sp.), the single woody plant species in the high arctic, in characteristic ground-clinging posture.*

million years since the impact, however, most of the peak has been eroded away. The impact structure has been named Haughton Crater after a name given by the original geologist to the "salt dome" he found.

During part of July and August of last year I had a chance to be a member of a Canadian expedition to search for meteorites on the ice cap of eastern Devon Island. When that part of the expedition was over, I remained with Robertson and a field assistant, Chris Pitre, to fly to the Haughton area, set up camp, and run a different kind of survey—this time a magnetometer survey, over the structure.

We flew out of Resolute Bay, on Cornwallis Island—just west of Devon Island, in a Twin Otter aircraft with all our equipment on July 30. We landed on a flat gravel surface next to a river, not too far from the center of the impact structure, and put up three tents. A small portable transmitter radio was hooked up so we could communicate with the Resolute Bay station. The place we camped was starkly beautiful. The area looked just like the desert of central Arizona—but without the trees and cacti. The valley of the nameless river, beside which we were camped, was enclosed between two rows of beautiful mountain ridges—one of them blanketed with the pale gray, almost white, coating of pulverized rock that had been blown out of the impact crater so long ago and settled over the hills surrounding the crater.

The river was shallow, ice cold, crystal clear, and made a pleasant sound as it splashed over the rapids in front of the two tents set up for sleeping. It meandered back and forth across the valley floor, fed by tributaries that entered it from melting snowfields on the mountain sides. The valley floor was made up of a series of gravel terraces, each quite flat, that were deposited during the retreat of the ice cap from this half of Devon Island.

Our field work began as soon as the camp was set up. Robertson and Pitre were going to do the magnetometer survey; my main interest was in collecting specimens of shatter cones and impact-shocked bedrocks for study and for use in future exhibits in the Museum, as well as for possible exchanges with other museums. Up to this time only a small collection of specimens had been made of the Haughton area by the few government geologists working on it. The Field Museum was to have the first chance to collect for broader uses. In fact, I was the first outside (*i.e.*, nongovernment) geologist to visit the area since it was recognized as a crater.

In doing work here, field parties have come to use small all-terrain vehicles—ATVs. I have always opposed these machines, which allow men to smash their way into remote places. Inexcusable damage has been done to areas of the southwestern deserts in Arizona, New Mexico, and California. In those cases, use of ATVs has caused compaction of soils, resulting in the destruction of the flora and subsequent negative effects on the fauna. The compacted soils are also crushed into smaller grain sizes, which are more easily blown and washed away.

So it was with great concern that I found our party supplied with three ATVs, one for each of us. As I walked over the desertlike terrain near the camp I realized that no damage could be done to the soils, flora, and fauna—there weren't any! This was a desert of compacted gravel, boulders, and rock outcrop—a high arctic desert. The only flora consists of small, widely scattered patches of mosses, a few algal mats along streams, a wildflower here and there, and an occasional small, sprawling willow clinging to the ground. No soil is developed. The field parties use ATVs because these vehicles make it possible to cover large distances and visit more outcrops than would be possible on foot. In the arctic, field seasons are short and every effort is made to do the maximum amount as quickly as possible. The availability of ATVs and the ability to work around the clock with 24 hours of daylight make it possible to get a lot of work done each season. In general, Canadian activities in the arctic are becoming more and more responsible. Field parties are now required to bring out all their garbage and to leave campsites as they found them.

In spite of the justification, I approached my little, balloon-tired puddle-jumper with a lack of enthusiasm. As it turned out, the vehicle was

Canadian government geologist Blyth Robertson (left) and assistant Chris Pitre atop a mass of gypsum crystals formed by ground water deposition.

actually of little use to me. Driving along at the vehicle's lowest possible speed, I was still moving too fast to examine loose specimens and outcrops. When walking, I saw far more, and got better samples. Besides, I came to hate the exhaust fumes and the engine noise. Walking across that vast, empty, unexplored land in complete silence, with only a whisper of wind or the subtle rumble of a distant stream or waterfall is too extraordinary an experience to be spoiled by motor fumes and noise. I used the vehicle on only two occasions, and on one of these it rolled over on me when going up a slope so steep that I shouldn't have tried to climb it in the first place. The vehicle rolled over a dozen times as it tumbled down the slope, but afterward it still ran just fine.

The day after my accident, Chris went over a cliff with his ATV. He escaped serious injury, but his vehicle was smashed beyond immediate repair. From then on he rode my vehicle and I did my traverses happily on foot, and alone.

On one of these traverses, a beautiful sunny day, I was walking through a valley many miles from camp when I came across fairly fresh polar bear tracks. I didn't have anything along for defense because I had mistakenly assumed the bears wouldn't get that far away from the sea—about 20 miles. There are few incidents of serious bear attacks; however, those few are enough to keep up your respect for them. Subsequently, I carried a loaded rifle on all my treks. This gave me a feeling of security, although I had to admit to myself I would find it just about impossible to shoot one of these animals. I hoped that shooting at it might be enough to scare it away. I also carried an old beer can containing small pebbles, for it is said that polar bears will run away from loud, clanging sounds. Happily I never had a chance to test out this theory—or fire the rifle.

One day a helicopter came in to spend the

Pitre, Robertson, and Olsen (l. to r.) pose by cook tent with all-terrain vehicles.

day with us putting in magnetometer reference stations. Because of rapid fluctuations in the magnetic field in this region, so close to the north magnetic pole, it was necessary to place all the reference stations as quickly as possible —hence the helicopter. This process involved landing at a chosen site, taking a magnetometer reading, marking the spot with a rock cairn, hopping into the helicopter again, taking off to a new spot, miles away, and repeating the process. We made sixteen stations that day. It would have taken several days to do the same thing by surface travel, even by ATV.

Like most polar field work, north or south, there is a pattern of intense activity followed by periods of boring inactivity when the weather is too rotten to work, or while waiting for aircraft. On this trip we had long stretches of fog, drizzle, rain, a few snow flurries, and heavy overcast skies. After a period of several days of drizzle we noticed that the little babbling stream in front of our tents was rising. Our pretty, blue creek had turned green, was cloudy with fine sediment, and had grown into a deep, formidable roaring river. By putting reference-marker stones along the gravel bank that contained it, we figured the creek was rising at about three inches an hour. In a few hours our tents would be flooded. So we moved the two sleeping tents to a higher gravel terrace, but left the cook tent where it was, on slightly higher ground away from the river. In the arctic it is always wise to put the cook tent a long walk from the sleeping tents. If a polar bear shows up it will probably go for the cook tent, with its food odors, first. The clattering of pots becomes your warning to get up and either run or shoot it out. If you're far enough away you have a chance.

After a few hours the river was a raging torrent, cutting away at the gravel banks. By 11 p.m. the drizzle stopped and we determined the river had ceased to rise—to only an inch below the first terrace level. We left the sleeping tents where they were in case of future rain.

In spite of the off-and-on bad weather, our work was soon completed. It was an unusual period. Every few hours a swell of fog would pour through the mountain passes from the direction of the sea and settle in the impact basin. The wind would finally dispel the fog, giving us an hour of clearer weather—still dull gray—before the next fog layer, sitting over the seacoast, would become deep enough to pour over the passes onto us again.

The Twin Otter from Resolute was supposed to come in on one particular evening and take out our camp, but this fog-clear-fog weather situation meant that landing was impossible. With 24 hours of daylight the plane might arrive at any hour of the "night." By midnight our weather had improved marginally and the sun made the northern sky dull red. This was one of those boring waiting periods that are part of arctic field work. As I wandered along the bank of the swollen river I saw a flight of nine eider ducks land on a gravel bank. They consisted of adults and a couple of birds that appeared somewhat small—like the young of this season. They were the only living animals I saw during this time at that camp, and were grouping for the migration south—August 7. It was time to leave the high arctic. □

The Plains Indian Bull-Boat

Specialized Transportation on the Upper Missouri River

By JAMES W. VANSTONE
Curator of North American Archeology and Ethnology

1 *Early Western Travels, 1784-1897*, R.G. Thwaites, ed.

In 1891 Frederic Ward Putnam, curator of the Peabody Museum of American Archaeology and Ethnology at Harvard, was appointed chief of the Department of Ethnology and Archaeology for the World's Columbian Exposition in Chicago. His task was to assemble a large anthropological collection for the world's fair in 1893, and for this purpose field parties to various parts of the world were directed to collect ethnographic specimens and other materials representing many different cultures.

Early in 1892 Putnam wrote to A. W. Fairbanks of Fort Berthold, North Dakota, requesting that Fairbanks collect ethnographic specimens from among the Plains Indian tribes of the upper Missouri River region. This material was apparently collected and shipped, but when it was accessioned on October 31, 1893, by Field Columbian Museum, established to house collections gathered for the world's fair, the only specimen that could be located was a bull-boat,* an example of one of the most primitive skin-covered canoes built by the Indians of North America.

Bull-boats were not actually canoes, but rather coracles similar to those used in Ireland and by the ancient Britons. They were bowl-shaped and suitable only for use on streams where ferrying would be the primary requirement. Although all Plains Indians living near streams probably once constructed bull-boats, this form of vessel is associated most frequently with the Mandan, Arikara, and Gros Ventre, who used it to cross the Missouri River and its tributaries.

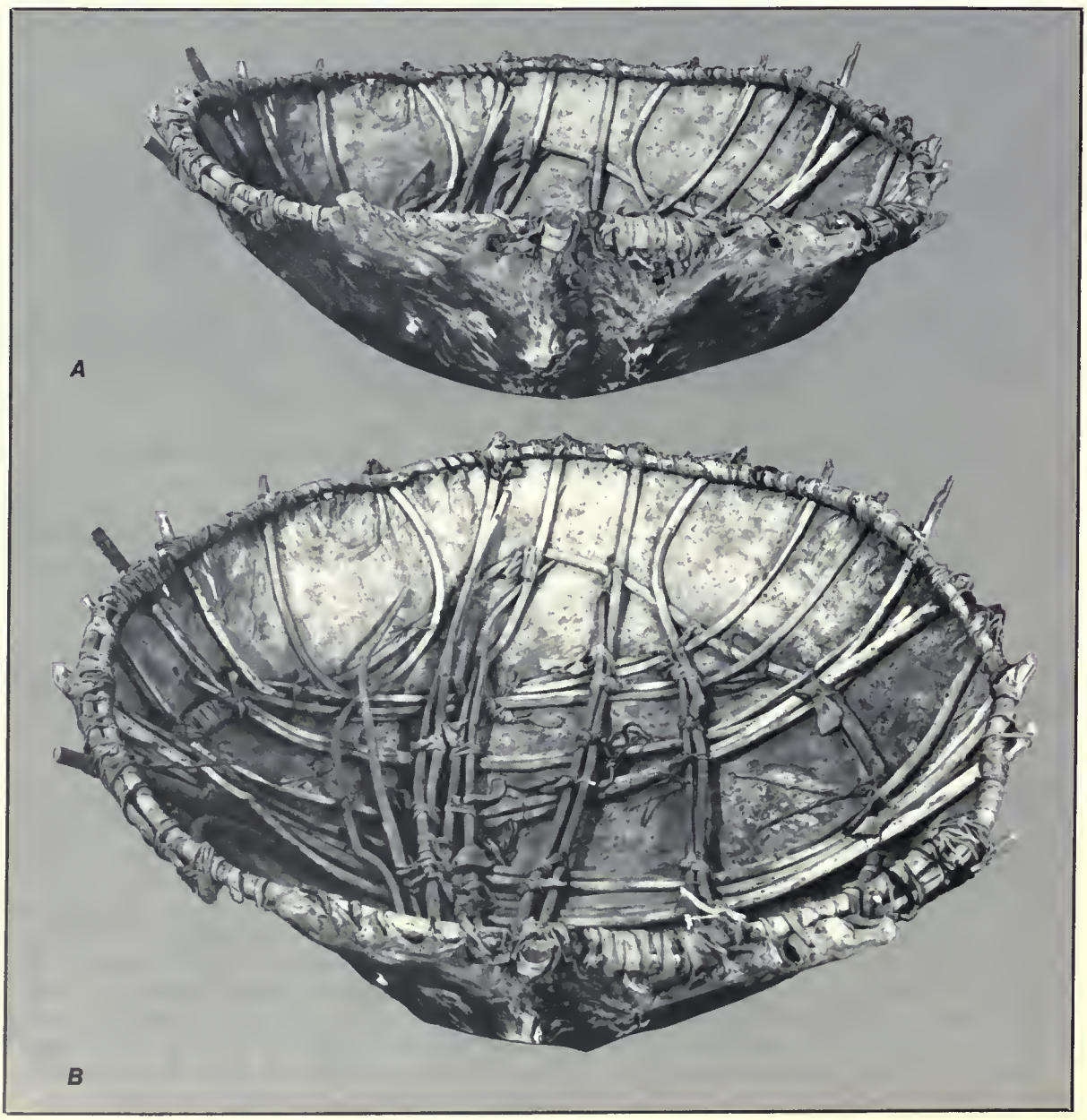
Many boats from various parts of the world were collected for the World's Columbian Exposition and subsequently accessioned by Field Columbian Museum (in 1906 renamed Field Museum of Natural History). In 1929 the Museum donated a collection of 75 boats—one of the finest assemblages of aboriginal water craft in the world—to Chicago's Museum of Science and Industry, apparently hoping to solve a storage problem. Because that institution also had no facilities for storing such a large collection, ar-

*Catalog number 15568

rangements were made to place the vessels in temporary storage under the seats in Soldier Field, across the street from Field Museum. When new construction was undertaken at Soldier Field in 1937, virtually the entire collection was destroyed by the Chicago Park District "in the belief that they had been used in the past for pageants, festivals and parades and because of their age were no longer usable."[1]

Field Museum's bull-boat was slated for inclusion in this collection of deaccessioned boats, and in the catalog of the Department of Anthropology is the notation that the specimen was "sent to Rosenwald Industrial Museum [Museum of Science and Industry] 12/13/28." For reasons that are unclear but extremely fortunate, the bull-boat was not included in the collection stored in Soldier Field. It disappeared, however, from Field Museum's collections and was rediscovered only in 1968 when extensive renovations were made to the building's fourth floor for the newly created Department of Exhibition. When found, the bull-boat was in a crate, perhaps in anticipation of removal from the Museum. In any event, it has been preserved and is one of the few water craft remaining in the Museum's North American Indian collections.

Wherever they occur, bull-boats are always described as temporary craft constructed for special purposes. Unlike the Eskimo kayak, from which the skin cover can be removed because the parts of the frame are rigidly lashed and pegged together, bull-boats were usually built according to bark canoe methods, whereby the covering was part of the structure holding the framework together.[2]



2

3

Smithsonian Institution National Anthropological Archives, Bureau of American Ethnology Collection

Field Museum's specimen has shallow, flaring sides and is covered with cowhide (with the hair side on the exterior) rather than with the buffalo hide ordinarily associated with traditional craft. The vessel has a diameter of approximately 51 inches and is about 20 inches deep in the center. The rim is made of overlapping willow branches, lashed together at intervals with strips of willow root; the cowhide is also lashed to the rim with root strips. Below the rim on two sides and running in the same direction are more strips. The framework is made of bent willow branches placed at right angles to one another in more or less haphazard positions. Where they cross, these branches are lashed together with strips of cloth (fig. 2). It seems clear that the craft was built up on the skin.

Over the years, as the cowhide has dried, the supporting framework has twisted and slipped; some branches have punctured the hide. When it was new, the boat was probably somewhat deeper than now; the sides were less flaring, and the shape more regular. Nevertheless, it is obvious that the vessel is not well made; Fairbanks, in fact, cautioned Putnam in a letter of September 20, 1892, that "this boat is really not a very good specimen of a bull-boat but it was the best I could obtain at the time."[3]

Early travellers on the Missouri River and its tributaries admired the versatility of the bullboat and described it in considerable detail. One of the earliest of these descriptions, written by a member of the Lewis and Clark expedition, is of vessels made by the Arikara and Mandan.

> *These are made in the following manner: two sticks of an inch and a quarter in diameter are tied together so as to form a round hoop, which serves for the brim, while a second hoop, for the bottom of the boat, is made in the same way; both are secured by sticks of the same size from the sides of the hoops, fastened by thongs at the edges of the hoops and at the interstices of the sticks; over this frame the skin is drawn closely and tied with thongs, so as to form a perfect basin, 7 feet 3 inches in diameter, 16 inches deep, with 16 ribs of cross-sticks, and capable of carrying six or eight men with their loads.*[4]

Although this account appears to suggest that the vessels described had rigid frames, it is probable that once constructed, their covers could not be removed without collapsing the framework. These boats were also considerably larger than most craft of this type. On August 8, 1806, three members of the Lewis and Clark expedition constructed such a boat in order to descend the Yellowstone River: "In these frail vessels they embarked, and were surprised at the perfect security in which they passed through

the most difficult shoals and rapids of the river, without ever taking in water, even during the highest winds."[5]

Another, somewhat later, description is provided by E. T. Denig, a trader on the upper Missouri from 1833 to 1856. Noting that Arikara bull-boats were used for crossing the Missouri, he went on to say that

The body of the boat is made of willows, bent round in the form of a basket and tied to a hoop of the same at the top, which hoop is about three or four feet in diameter. The hide of a buffalo, either fresh off the animal's back, or if dry, well soaked in water, is stretched over the frame, the hair inside. It is then turned upside down, dried, and sometimes smeared over with tallow.[6]

The North American Indians, by Edward S. Curtis

4

Other early observers also noted that the hair often faced in rather than out, as it does on Field Museum's boat.

Interesting and instructive drawings of bull-boats were made by Charles Bodmer, the artist who accompanied Prince Maximilian of Wied on his travels through the Plains region in 1832–1834 (fig. 1). and by Rudolph Friederich Kurz, whose drawings of women carrying bull-boats were made in 1851 (fig. 3). These illustrations, together with the descriptions just given, suggest a more precise method of construction than is to be found in Field Museum's specimen.

As might be imagined, the propelling of a bowl-shaped vessel required a specialized technique. Denig's description is especially graphic:

Usually these boats are propelled by the women, one in each boat, which also contains the meat of the same [buffalo] cow whose hide made the canoe. She uses a paddle in front making a pawing motion directly under the boat which turns half round to alternate sides at each stroke of the paddle.[7]

In his letter to Putnam quoted earlier, Fairbanks described the paddling of a bull-boat as follows:

If used by a single person, he takes his place in the boat to one side, usually balanced by a stone on the other side but I have seen them without. Then [he] uses the paddle to pull himself forward [and] at the same time as the paddle leaves the water he gives it a twist which offsets the current and keep[s] the boat directly across the river. The first part of the stroke also is made upward towards the current as well as forward.

Famed photographer Edward S. Curtis, who visited the Mandan about 1907, provides an obviously posed but informative view of a woman paddling a bull-boat (fig. 4).

Denig emphasized that although the bull-boat was usually associated with women, both sexes were expert at this type of navigation.

Parties of both [sexes] go for some distance up the Missouri in the summer when the hair of the animal is not seasonable, kill buffalo, make canoes of the hide, put meat in and each one paddles his boat to the village. Fifty, sixty, or a hundred canoes can be seen, all loaded, manned or womaned by a single paddler, plying their way even in high wind down the rapid and dangerous current of the Missouri.[8]

In his letter to Putnam, Fairbanks reported that he had seen vessels similar to the one he collected cross the Missouri loaded with three women, a child, and many bags of flour without seeming to be affected by a rapid current. In 1847 Charles Larpenteur, a fur trader on the upper Missouri, observed a party of 22 Arikaras going to war against the Sioux in 11 bull-boats.[9]

There were, however, some drawbacks to these versatile water craft. Alexander Henry and David Thompson, fur traders writing at the beginning of the nineteenth century, observed that although these boats were capable of carrying great loads, it was necessary to unload them once each day and dry them in the sun or over a fire; otherwise they would become waterlogged and sink.[10]

Temporary or emergency water craft, common among North American Indians, varied from relatively simple vessels like the bull-boat to sizeable boats with crudely constructed but rigid or semi-rigid frames. One of the more complex forms was used by Eskimos living along the Kuskokwim River in southwestern Alaska; in the fall they moved up tributaries by canoe to hunt large game animals. After hunting for a month or more, they cached their small canoes to be picked up during the winter and the hunters assembled their catch near a stream where a boat was built for the return trip. The frame of the new boat was constructed of spruce or alder and covered with the skins of freshly killed caribou or

5 Wendell H. Oswalt

bear. Its size depended on the success of the hunters. Although these vessels were undoubtedly clumsy, they were also very flexible and thus able to safely negotiate swift streams, bouncing off the projecting rocks that were an ever-present hazard.[11]

One vessel of this type, seen at the village of Kwethluk on the lower Kuskokwim River in the spring of 1956, was of modified-traditional form but appeared to resemble closely the type of craft used in aboriginal times (fig. 5). This boat was large, approximately 30 feet long but less than two feet deep, and similar to the traditional Eskimo umiak, being pointed at both ends. The frame, made of roughly worked strips of alder wood, was nailed together and covered with bear skins, one of which is shown in the photo. The use of nails in constructing the frame doubtless made it more rigid than would have been the case with the skin or root lashing used in aboriginal times. The vessel's shallow depth was characteristic of its type.

The Plains Indian bull-boat was obviously a less ambitious craft. Some were even too small to carry a person, but were intended to be loaded with cargo and towed by a swimmer. Although the previously described vessels encountered by the Lewis and Clark expedition were apparently very large, specimens preserved in museum collections indicate that a craft more than five feet in diameter and made of more than one skin was extremely rare. Most examples are built on a single skin and are approximately the size of Field Museum's boat. □

NOTES

1. Letter of April 19, 1938, from E.I. Kelly, director of Special Services, Chicago Park District, to J.W. Block, registrar, Museum of Science and Industry.
2. Adney and Chapelle, 1964, p. 219.
3. Department of Anthropology files, accession 55.
4. Coues, 1893, vol. 3, p. 1,172.
5. *Ibid.*
6. Denig, 1961, pp. 51-52.
7. *Ibid.*
8. *Ibid.*
9. Larpenteur, 1933, p. 213.
10. Henry and Thompson, 1897, p. 181.
11. Oswalt, 1963, pp. 126-27.

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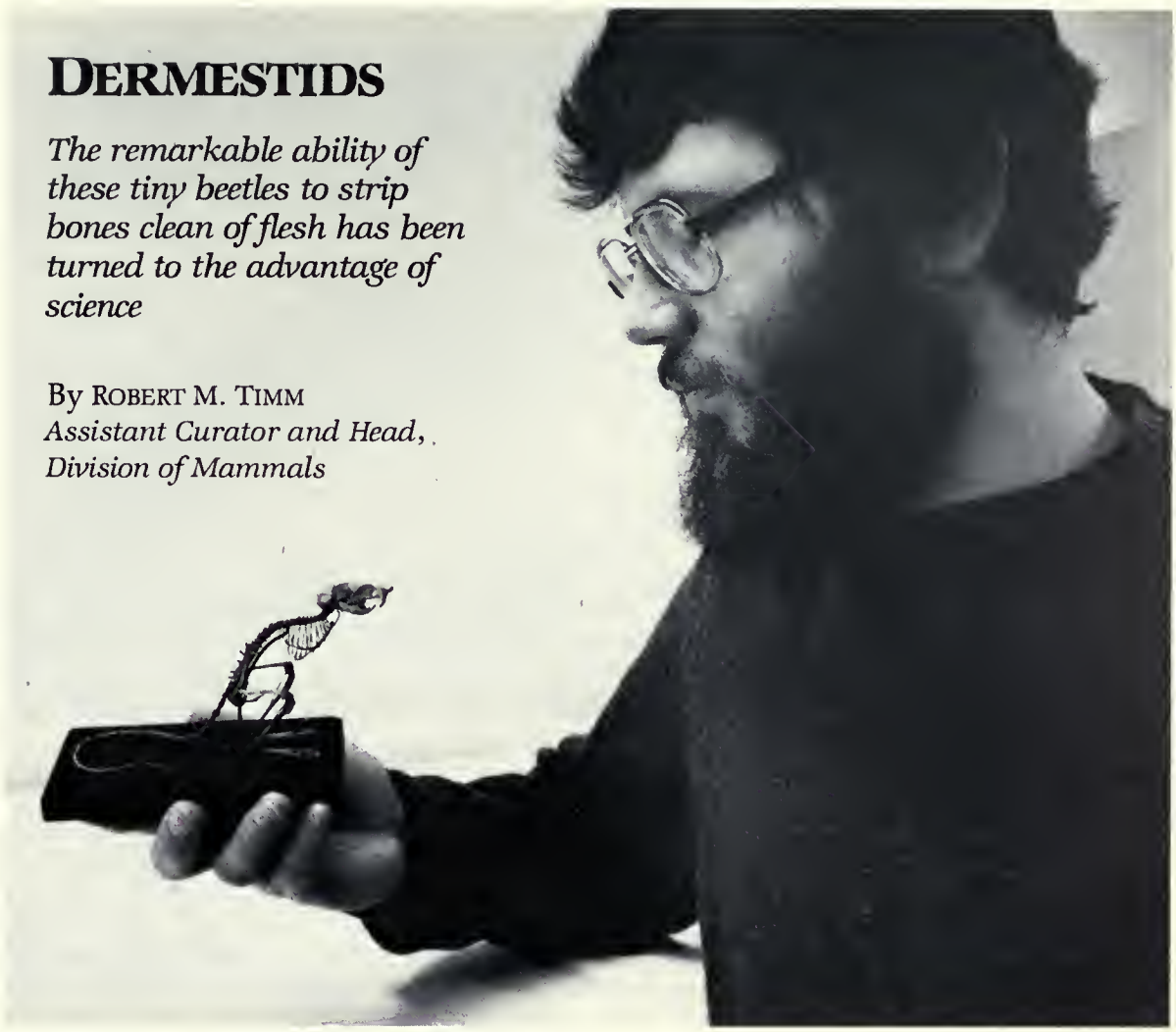
DERMESTIDS

The remarkable ability of these tiny beetles to strip bones clean of flesh has been turned to the advantage of science

By ROBERT M. TIMM
Assistant Curator and Head, Division of Mammals



Author Robert Timm with mounted skeleton of kangaroo rat that had been cleaned by feeding dermestid beetles.

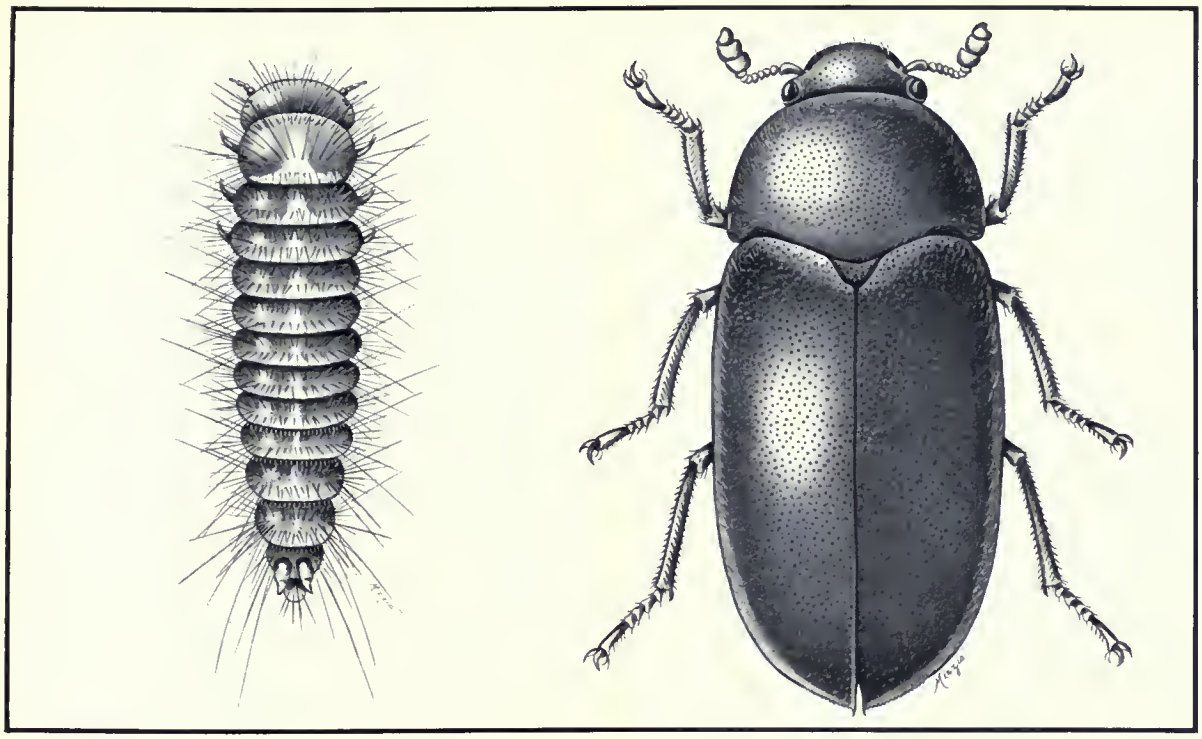
D. Walsten

Curiously, the busiest room at Field Museum is one of the least known. It houses thousands of workers who go uncomplainingly about their task 24 hours a day, seven days a week, 52 weeks out of the year. The name of this room, tucked away on the third floor, is "the Bug Room"—a matter of irony, since it's located in the Division of Mammals, not in Insects.

The solution to this seeming conundrum is simplicity itself: In the Bug Room are cages of various sizes, each containing hundreds or thousands of matchhead-size beetles of the species *Dermestes maculatus*, all gnawing happily away at the carcasses of dead animals. In return for the free meal, these carrion eaters are performing an invaluable service to the Museum and to science: they are able to clean an animal skeleton of its flesh more efficiently than any other way—chemical or biological—known to science. Given the time and the right conditions, such as humidity and temperature, an army of dermestids can reduce the body of a shrew, a dog, or a horse (even, theoretically, a whale!) to a gleaming skeleton, still articulated (*i.e.*, with its bones still properly interconnected). Muscles and fat are all grist for the dermestids' gastronomic mill—leaving the bone, eschewed as it were, rather than chewed.

Since science first recognized the animal skeleton as something to be preserved and studied in a systematic fashion, scientists have looked for ways of cleaning from the bones the extraneous tissues that surround them in life. In former times, the carcass was simply soaked in water until the bacterial action broke down the soft tissues; then began the tedious manual process of picking and scraping off the remaining bits of tissue. Not only was this tiring and time-consuming, the results were never satisfactory. If the bacterial decomposition went on too long, the bones became disarticulated and teeth fell out. Too little soaking meant that extra time was needed for the hand-cleaning stage, and tendons and ligaments usually required more attention. The end result was poorly cleaned, piecemeal material.

So zoologists were constantly on the lookout for a better method, and they experimented with ants, clothes moth larvae, mealworms,



Dermestes maculatus *(larva left, adult right), sometimes called the leather beetle, is the dermestid species used for cleaning skeletons at Field Museum. Larvae grow to slightly more than ½ inch long, adults are somewhat smaller. Drawings by Rosanne Miezio.*

crawfish, marine isopods and other biological methods—to say nothing of corrosive chemicals. All had serious drawbacks. Then, in the 1870s, in France, dermestid beetles were tried, and they came through with winning colors. About sixty years ago dermestids came into use in American museums, and today colonies of these beetles are standard equipment wherever larger collections of vertebrate skeletons are maintained.

Dermestid beetles, which constitute the family Dermestidae, are worldwide in distribution, with about 700 known species—125 in the United States and 25 in Illinois. About 50 have reputations as pests of stored animal and plant products, consuming everything from Jello to rugs to wool sweaters to butterfly collections. Of these dermestids, a few have proven useful to scientists as bone cleaners; some don't adapt well to colonization, however (whole skeletons are cleaned efficiently only with self-perpetuating "colonies" of hundreds or thousands of in-

Barbara L. Clauson

U.S. dime shows relative size of beetle grub and tiny, partially disarticulated shrew skeleton, cleaned by the beetles.

Scanning electron microscope photos of D. maculatus: *(above, left) head of first instar, or growth phase, of larva magnified 125 times; (above, right) head of first larval instar X520; (opposite page, top left) urticating, or irritant, hairs that cover the grub's body X690; (this page, below) head of adult X33. Photos by Robert Timm.*

dividuals); others are not efficient enough in cleaning up soft tissues or are too rough with the bony parts.

Dermestes maculatus, the dermestid species we use at Field Museum, is commonly known as the leather beetle, because of its special fondness for leather and fur. (Before effective insecticides were developed it was a serious pest in industries that dealt in these products.) When properly cared for, *D. maculatus* is highly prolific; a female may lay 500 or more eggs; these eggs hatch two to ten days later into grubs, which grow to adulthood in six to nine weeks. The larval period may be protracted for years if the temperature and humidity are not optimal and food is scant.

The newly hatched larvae, 1mm long (1/25 inch), are voracious eaters, and an army of

grubs can reduce a shrew, or mole, or bat to a skeleton overnight; a horse may take a few weeks. The larvae molt six or seven times, and when fully grown at 15mm are ready to pupate. When this time comes, they bore into whatever

Barbara L. Clauson

Timm brushes beetles from cleaned kangaroo head. Surgical mask prevents inhalation of dust-size particles of dried beetle exoskeleton, larva setae (hairs), and excreta that pervade air of Bug Room. Prolonged exposure may result in allergic reaction.

Barbara L. Clauson

Dermestid adults and larvae at work on squirrel head.

D. Walsten

Timm in Bug Room with largest of several dermestid colony cages. The cage lids as well as the double doors to the Bug Room are precision sealed.

material is at hand, finding a snug, isolated spot to lie dormant for 7 to 14 days. One of the extraordinary facts about the dermestid is the ability of this pupating grub to bore through the hardest material—even through the mortar and stonework of walls; lead pipes, cables, and electrical fuses have proven notably vulnerable to them. Hakluyt's *Travels* records that in 1593 a ship carrying a cargo of dead penguins was made unseaworthy by the hundreds of thousands of tunnels bored into the wooden hull by pupating dermestid larvae (after feeding on the penguins).

Cleaning the bones with dermestids is both good husbandry and an art; it is not simply a matter of throwing the bones to the bugs. Before being placed in a beetle colony, the animal's body is skinned, eviscerated, and the larger muscle masses removed. The beetles prefer to feed on tissue that is well dried—but not too dry. Temperature and humidity control are also critical, and the beetles are extremely sensitive to mold and mites; either can wipe out a colony overnight. At the Field Museum we use dermestids not only for cleaning the skeletons of mammals, but also those of birds, reptiles, amphibians, and fish—dried fish seems to be their favorite.

But we must pay the price for this wonderful talent: since dermestids will nibble on just about anything that is dead (including Egyptian mummies), natural history museums must take special care that their dermestid guests are housed in carefully sealed quarters. The Bug Room has a double set of tightly fitting doors and each colony container (commonly a tropical fish aquarium a few cubic feet in volume) has a dermestid-proof lid.

The beetles also pose a unique health problem for technicians who must work with them. Persons exposed to the room's air over a period of time may develop a host of disagreeable symptoms that are an allergic reaction to substances in the beetle's system: itching of the skin, hives, irritation of the eyes and respiratory passages, cold sweat, weakness, fever, headache, and nausea are all part of the syndrome. An allergic person who is overexposed to the room's atmosphere may even go into serious anaphylactic shock of the sort that can befall a bee-sting victim.

The allergic reaction is the result of breathing microscopic particles of dead beetle exoskeletons, molted grub skins with their fuzz of irritant hairs, and excreta—all floating in the air as a fine, impalpable dust. The only protection against this insidious hazard is to wear a surgical mask.

What good are all these old bones? Does anyone ever look at them? The answer is a resounding *YES*. In the past year, the mammal collection received some 800 visitor-days of use by professionals (in addition to that by our own staff), and we sent out almost 100 loans of specimens to scientists at other institutions. The loan and visitor use of the Field Museum collection is one of the busiest such arrangements in the scientific world. During this 12-month period, scientists in 28 states and 11 foreign countries made use of it—including mammalogists, anatomists, archaeologists, paleontologists, anthropologists, and veterinarians. In recent years, an annual average of more than 40 published technical papers and scholarly books have involved research based on the study of our specimens—many of which had been beautifully "prepared" by the remarkable dermestids. Once looked upon as just a pest, *Dermestes maculatus* has risen to become a valued tool in the pursuit of scientific knowledge. □

AYER FILM LECTURES

March and April

JAMES SIMPSON THEATRE

Saturdays, 1:30 pm

The Spring Edward E. Ayer Film Lectures are offered each Saturday in March and April. **Please take special notice of the new, earlier starting time—1:30 pm.** These 90-minute travel films are narrated by the filmmakers themselves, and are recommended for adults. Admission is free at the Museum's barrier-free West Entrance, located on the ground floor. Handicapped persons have access to the theatre via this entrance. Doors open at 12:45 pm for Museum members. When the theatre has reached full seating capacity, the doors will be closed by Security personnel in compliance with fire regulations.

Roger A. Powell

March 6
"Footloose in Newfoundland,"
by Tom Sterling
A visit to Newfoundland brings you the wonders of nature—the great fiords, bird colonies of gannets and kittywakes, whales, moose, and tundra plant life. Sterling also introduces you to the people of Newfoundland—their families, "outports," and daily life.

March 13
"Switzerland," by Ric Dougherty
Visit Chateau-D'Oex, a tiny hamlet of Swiss chalets, ride up Mount Rigi, and trek to the Matterhorn. Watch the Reynaud family making Gruyère cheese, and stay to welcome the celebrants from Vivey of The Feast of the Wine Growers, Europe's greatest folk festival.

March 20
"In the Footsteps of Richard Halliburton," by William Stockdale
From London to Spain, to India and Khyber Pass, we follow in the footsteps of adventurer Halliburton (1900-1939). He climbed the Matterhorn, swam the Hellespont, and sailed a junk out of Hong Kong, never to be heard from again. Join Stockdale as he retraces Halliburton's travels.

March 27
"China After Mao," by Jens Bjerre
This fascinating film invites you to sail down the beautiful Likian River, explore giant caverns, tour Peking, and take a train ride through China to Kwangchow (Canton). Bjerre also explores the many changes in China since the death of Mao —changes which have deeply affected each individual with new freedom.

April 3
"The Galapagos," by John Wilson
A devoted naturalist and cinematographer, Wilson explores the Archipelago of Columbus—better known as the Galapagos. Because these islands are isolated, they are home to some of the world's most remarkably adapted wildlife. Scenes include the courting of the albatross, a climb to the top of Volcan Fernandina, and a trip to Alcedo Crater—home of the Galapagos Tortoise.

April 10
"Paris and the Seine,"
by Kathy Dusek
The film begins in the hills of Burgundy, then on to the medieval city of Troyes. See Paris at sunrise, the flower market, and the Louvre. Visit Rouen and hear the story of Joan of Arc. Finally we arrive at Normandy and Le Havre—totally rebuilt since World War II.

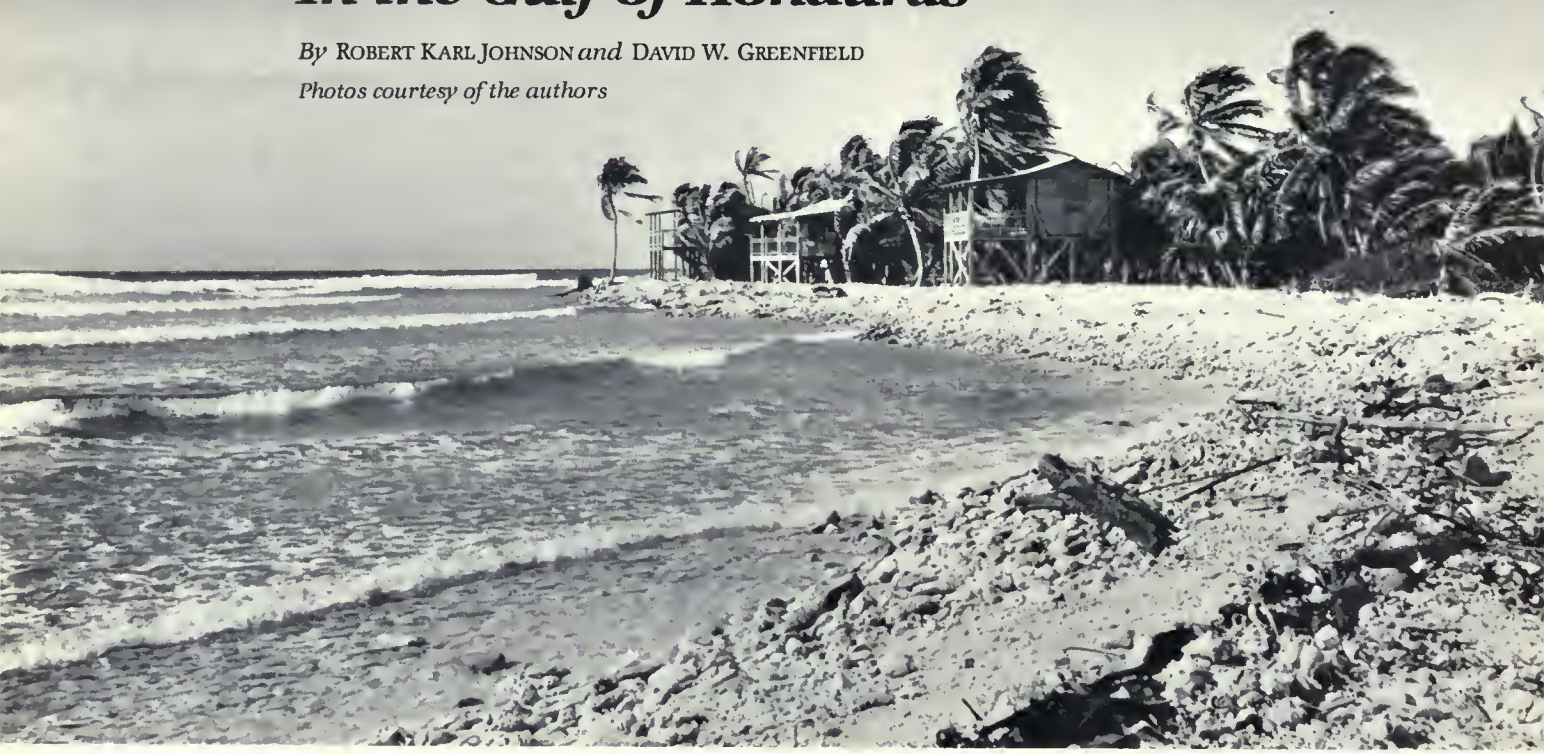
April 17
"South and East Africa,"
by Ted Bumiller
An exciting film safari to the great continent of Africa. Game preserves abound with wildlife—elephants, leopards, and crocodiles. Watch fishermen catch the 200-pound Nile perch; climb Kilimanjaro, visit Nairobi, and meet Africa's many peoples.

April 24
"Himalayan Odyssey,"
by Frank Klicar
The Himalayas are the meeting place for Buddhism, Hinduism, and Islam. Pilgrims seek spiritual enlightenment at Bhaktipur in Nepal, Rishikesh on the Ganges, and at the Tibetan monasteryof Leh. Village activities center on grain planting and harvesting, processing tea, making rugs, raising livestock, and paper-making.

GONE FISHING
In the Gulf of Honduras

By ROBERT KARL JOHNSON *and* DAVID W. GREENFIELD

Photos courtesy of the authors



Cabins overlooking reef crest at Long Cay, Glovers Reef.

Crystal clear water, multihued coral ramparts, the continuous line of surf on the windward reef, palm-covered cays seemingly suspended between the blue of sky and sea—these are what come to mind when thinking of the coral reefs of the Gulf of Honduras. But for those of us who are studying the fishes of the western Caribbean, there are additional images and rewards: the discovery of species new to science, captures of rare species known from few individuals, and the chance to learn about the life histories, ecology, and distribution of these and other coral reef fishes not previously studied. It is the lure of these opportunities that has caused us to return to the western Caribbean each of the past 11 years.

Our association with the nation of Belize and the western Caribbean began in 1970, when one of the authors (Greenfield) moved to Northern Illinois University from California. There existed at NIU the opportunity to help establish a program in tropical biology to be taught in Belize. Glovers Reef, an atoll 28 miles off Belize, has been since 1970 the site of a tropical marine biology course, which has drawn students from across the United States and Canada. Sampling of the Belize marine fish fauna also began in 1970.

Our collaboration on western Caribbean fishes began in 1975, with an expedition to the Miskito Coast of Honduras, a venture jointly sponsored by Field Museum, NIU, and the Museum of Zoology of the University of Michigan. We have since returned to Belize on numerous occasions, to teach the course in coral reef biology and to continue our investigations of the shorefishes of the Gulf of Honduras. Our collections to date number 382 stations, an estimated 10,000 lots,* and more than 100,000 specimens. These collections, all deposited at Field Museum, are without peer for the western Caribbean.

Belize, with an area of some 8,866 square miles, has a population of about 122,000. To the east lies the Caribbean, to the north the Yucatan peninsula of Mexico, to the west and south, Guatemala. Geographically diverse despite its small size, Belize has elevations ranging from

Robert Karl Johnson is curator of fishes and chairman of the Department of Zoology at the Field Museum; he is also adjunct associate professor of biological sciences at Northern Illinois University. David W. Greenfield is professor of biological sciences at Northern Illinois University and is a research associate, in zoology, of the Field Museum.

**A lot is all specimens of a single species collected at the same station. Fifty or more species are often taken at a single station on the coral reefs of Belize.*

sea level to about 3,680 feet inland and a mean annual rainfall ranging from 50 inches in the north to 220 inches further south. The flatter inland areas are covered with broad expanses of savannah. Hardwood forests are widespread, although much of the hardwood has been cut for timber or removed (by burning) to create farmland; in many places the tangled secondary undergrowth has formed dense jungle. The Maya Mountains running along the southwestern edge of Belize are blessed with many beautiful clear swift streams, waterfalls, caves, and tropical pine forest.

The entire coastal area is bordered by mangrove swamps, many of which connect to inland lagoons, providing a gradient from brackish to fresh water. Eight to twenty-five miles offshore lies the second longest barrier reef in the world, extending southward from the Yucatan peninsula some 168 miles into the Gulf of Honduras.

Offshore, between the mainland and the barrier reef, the waters tend to be clearer and saltier than along the coast; however, during the rainy season this zone receives vast volumes of freshwater runoff from the large tropical rivers, and its waters are more turbid and less saline than those of locations further offshore. Innumerable mangrove-covered cays are to be found here, often with shores of coral rubble covered with extensive algal mats and surrounded by vast beds of turtle grass.

There are three atolls in Belize (of 10 atolls or atoll-like formations in the entire Atlantic): Turneffe Islands, Lighthouse Reef, and Glovers Reef. Turneffe, which is closest to the barrier reef, has the most extensive land area, including a vast lagoon occupied almost throughout by mangrove swamp. Lighthouse Reef and Glovers Reef are farther offshore, more oceanic in character (*e.g.*, more saline, less turbid waters, etc.) and have the most extensive coral development. Their lagoons contain numerous coral-patch reefs, and precipitous dropoffs occur on the outside of the encircling reef structure. Neither has large islands, though there are a number of small cays at each, many thickly beset with coconut palms.

To the southeast of Glovers Reef, some 90 miles across the Gulf of Honduras, lies the island of Roatan, one of the Bay Islands. Unlike anything found in Belize, Roatan is a high island, with rocky shores meeting the sea as cliffs, rocky reefs, beaches of cobble, and with interspersed sandy beaches. Offshore lies a well developed coral reef system with precipitous dropoffs.

Thus, within a relatively small geographic area are found a great variety of habitat types.

This summer, the authors will continue their studies in Belize and Honduras. For the first time, Field Museum is joining with Northern Illinois University in offering Museum members a unique opportunity to join in the study and exploration of the reef systems of the Gulf of Honduras. For further information on this exciting program see "Field Museum Tours," page 25.

The variety of habitats in Belize and This variety contributes substantially to the richness of the Belizean shorefish fauna, which we estimate as nearly 500 species. Despite this richness, the fishes of the western Caribbean were very poorly sampled until the beginning of our efforts. New knowledge of the blennioid fishes, based on our sampling efforts, is illustrative of the gains we have made. In the past 11 years we have taken 60 species of "blennies" (four distinct families) in Belize and Honduras; 40 of these were previously unknown from Honduras, 27 unknown from Belize, 20 unknown from the Caribbean coast of Central America, and 4 were new species. A sixty-first species, also unknown to science, is being given formal scientific description by a colleague.

Honduras also offers the opportunity for the biologist to ask ecological questions relating to habitat restriction, distribution of diversity, and the coherence and organization of species assemblages. Over the years we have attempted to sample repeatedly from the full range of habitat types present and in stratified fashion over the depth range (to about 100 feet) practical with conventional scuba.

Because of the course offered each summer at Glovers Reef, our greatest concentration of effort at a single location (noting that Glovers Reef is a "location" 20 miles long by 6 miles broad) has been at this atoll. Rising some 6,000 feet from the off-reef sea floor, Glovers Reef is truly one of the finest reef structures in the tropical Atlantic. In 1971 the Smithsonian Institution sent a team of marine biologists throughout the Caribbean in an effort to identify the "best" coral reef site for possible study during the International Decade of Ocean Exploration; Glovers Reef was the team's choice.

The hundreds of patch reefs within the lagoon at Glovers Reef provide excellent opportunities for one to view numerous fish species in shallow water using only snorkeling gear. In the swarms of coral reef fishes* surrounding and inhabiting patch reefs, among the more conspicuous because of their behavior are the territorial species of damselfishes. Only several inches long, these fishes are so pugnacious they will take on virtually any invader of their territory, even nipping at a snorkeler's hand. Some damselfish species establish and maintain algal gardens from which they derive their food.

The typical day mode on a coral reef is a picture of color and movement—grazing parrotfishes and surgeonfishes, nibbling and browsing angelfishes and wrasses, actively territorial or midwater damselfishes, butterfly fishes, milling schools of grunts and snappers, and many others. The nocturnal picture is quite different, for at night the day-active species are mostly nestled into crevices. Conversely, the fishes active at night are for the most part not readily visible during the day, for they spend the daylight hours hiding in coral caves and crevices. Night-active species include the squirrel and

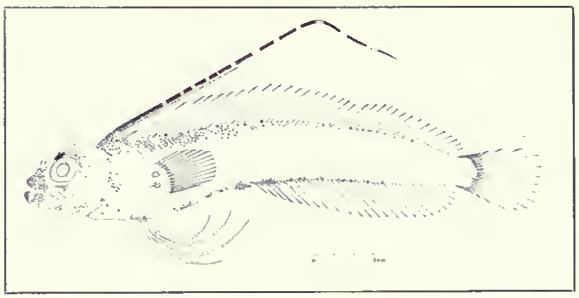
Hogfish in nighttime shelter at base of patch reef in lagoon at Glovers Reef.

"Fish," used in the plural sense, refers to more than one individual of the same species; "fishes" refers to more than one species.

soldierfishes, the cardinal fishes and sweepers. This changing of the guard is just one of the ways that make it possible for so many fish species to coexist on a coral reef.

For both the snorkeler and the scuba diver, the deeper reefs beyond the atoll rim offer exceptional beauty and excitement. The reef slopes gently from the rim to the edge of the dropoff with a system of ridges (spurs) and channels (grooves) providing topographic relief. At the edge of the dropoff the bottom seems to curl over as it plunges downward to a depth of several thousand feet in a jagged and terraced wall. To swim off the edge is to experience the dream of flight. Great concentrations of fishes and other sea life seem to occur at and just off the edge. Looking over it and into the "blue" one may see schools of larger, predatory fishes such as jacks, clouds of plankton-feeding species such as the creole wrasses, lumbering porgies, chubs that seem always in a hurry, and perhaps, with real luck, a sea turtle as it passes gracefully by.

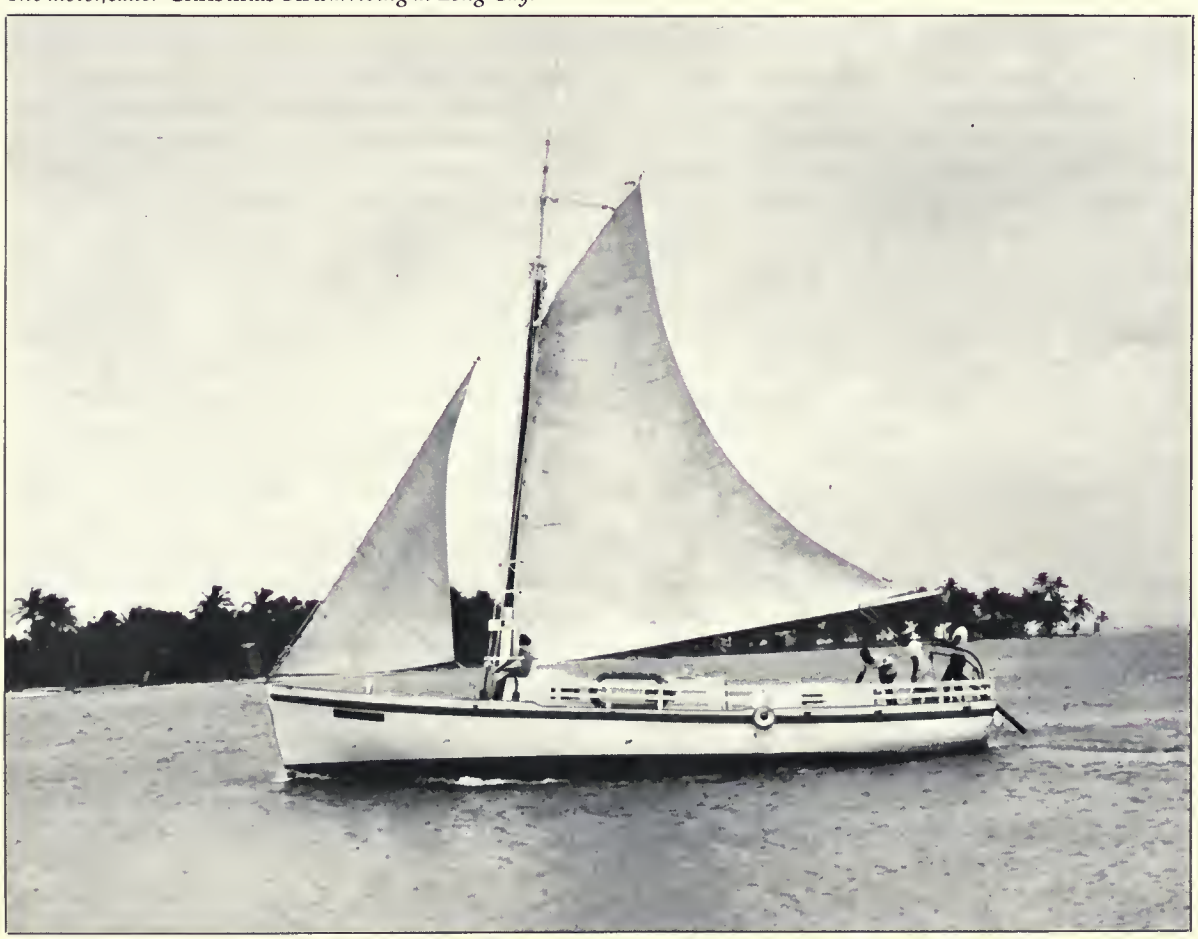
Until the advent of scuba and diving scientists, the cryptic species inhabiting the deep-reef and dropoff zones—species which spend their lives hidden in concavities, crevices, caves, and tubes—were all but unknowable. It is for this reason that our greatest gains in knowledge have included new light on "indwelling" species of this zone, including the discovery of species new to science.



Emblemaria hyltoni *Johnson and Greenfield 1976, the filament blenny, a species collected by the authors in 1975 and still known only from Isla Roatan, Honduras. Drawing by Zbigniew Jastrzebski.*

In addition to our studies at Glovers Reef we have been fortunate in being able to mount collecting trips along the length of the Barrier Reef, either cruising along the reef, stopping at a different area each day, or concentrating our studies on a particular site for periods of a week or more. Other collecting trips have taken us to numerous mainland sites, many of the cays inside the barrier reef, and to Turneffe and Lighthouse Reef.

The motor/sailer Christmas Bird *arriving at Long Cay.*



Grunts seek shelter in the reef by day and wander far from the reef at night in search of food.

Our goals are both faunistic and ecological. Eventually we hope to produce a book on the fishes of the Gulf of Honduras, a work that will, we believe, adequately characterize the western Caribbean shorefish fauna. We are also interested in distribution of species and assemblages of species on local and regional scales.

One result of our work thus far is the recognition of marked habitat preference and restriction in many of the small-bodied and cryptic species; the restriction applies not just to individual species but to groups of species. Using a variety of grouping and statistical techniques, we have been able to recognize and define groups of fishes that commonly co-occur. This accomplished, we were able to correlate the occurrence of these fish species groups with the occurrence of specific habitat types, depths of occurrence, and other phenomena. For the "blennies," we now know what kinds of habitat they occupy. Our data base seems sufficiently large, our techniques sufficiently robust, so that we can predict which species and group(s) of species will be present in particular habitat types. Except for extremely rare species, we have been able to corroborate prediction with subsequent observation and collecting. We are now applying these techniques to several other large groups of species.

The shorefishes of the tropical western Atlantic are perhaps better known than those of any tropical marine area comparable in size. This knowledge notwithstanding, our studies have shown that even at the most basic descriptive levels in taxonomy and zoogeography we have much to learn in the case of many groups. This is particularly true of cryptic, "indwelling" small-bodied fishes (those living in caves, crevices, tubes, etc.) such as many of the blennies and gobies. Species in just these two groups may account for up to one-third of the estimated 500 shorefish species in the Gulf of Honduras and, for most, we know next to nothing of their habitat requirements and life history. Yet it is bottom-associated, habitat-restrictive groups such as these that may have the most to tell us about zoogeographic pattern and history—for tropical Atlantic shorefishes.

Vital to this will be studies looking at distributions in terms of habitat specificity and broad-scale habitat patchiness over a suitably broad and diverse area. Because of the diversity of habitats represented within relatively restricted inshore to offshore distances, we believe that the Gulf of Honduras is an ideal area in which to make such an attempt. □

Field Museum Tours for Members

Coral Reef Biology and Natural History Explorations in the Western Caribbean

June 22-July 11

The richness of marine life and the beauty of the offshore reefs and islands of Belize and Honduras are unsurpassed in the Atlantic tropics. Field Museum's 20-day tour of this region offers a unique opportunity to explore and study tropical marine and terrestrial ecosystems and, if desired, to earn university credit for doing so. Leading the tour will be three professional marine biologists, each with considerable field work in the Gulf of Honduras and well acquainted with the local flora and fauna.

Included in the tour is a six-day stay at Glovers Reef, 28 miles offshore from Belize. Reef formations at Glovers are among the Caribbean's most richly developed. Lectures and field-trips, including snorkeling, will familiarize participants with the mammals, invertebrates, fishes, sea birds, and algae of this isolated, untouched coral-reef. Daily scuba diving is available. The 50-foot motor sloop *Christmas Bird* will take us to and from the reef, where we will stay at Lomont's Glovers Reef Village resort.

Our stay at Glovers will be followed by a four-day in-depth exploration of the central Belize mainland, including rain forests, the famed Blue Hole on the Hummingbird Highway, a stay at the Blancanaeux Lodge atop Mountain Pine Ridge, a visit to Rio Frio Cave and the Thousand Foot Falls, and exploration of Mayan ruins at Xunantunich. Aiding us for the four days will be Belize resident Dora Weyer, internationally known naturalist and expert on bird identification.

We will then stay five days at Roatan, one of the Bay Islands, where steep cliffs, rocky shores, and sandy beaches and associated wildlife provide a sharp contrast to the Glovers atoll environment. At Anthony's Key Resort, our Roatan home, first class accommodations, scuba facilities, fantastic sport fishing, tennis, etc., and superlative surroundings will add to our enjoyment. The tour will end with a day at San Pedro Sula, on the mainland, with sight-seeing and shopping or a tour to Mayan ruins at Copan.

Leading the tour will be Dr. Robert Karl Johnson, curator of fishes and chairman of Field Museum's Department of Zoology; Dr. David W. Greenfield, research associate in the Museum's Division of Fishes and professor of biological sciences at Northern Illinois University (NIU), and Dr. Norman A. Engstrom, associate professor of biological sciences at Northern Illinois University. Three semester hours of undergraduate or graduate credit in biological sciences are available from NIU to tour participants. The tour will be limited to 10 participants. The price is $2,385, from New Orleans (per person, double occupancy).

Harbor of Belize City David W. Greenfield

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

Ecuador and the Galapagos

March 11-25

The Galapagos Islands affect our imagination like no other place on earth. Field Museum is pleased to offer its members an opportunity to visit this remote archipelago under the expert guidance of Dr. John W. Fitzpatrick, associate curator and head, Division of Birds. If you are a "birder" or a "photographer" this tour is a Utopia.

We'll see 500-pound tortoises, ferocious-looking land iguanas that eat cactus flowers, marine iguanas which are superb divers, penguins, flightless cormorants, colonies of sea lions and fur seals, and many other exotic and unique birds, mammals, and reptiles. The plant life, with 40-foot cacti in coastal deserts and dense rain forests in the mountains, is equally interesting.

In addition to the unique sightseeing and learning opportunities on the cruise, we will spend four nights in Quito, Ecuador, where we'll enjoy old world ambience, along with the color of the centuries-old Indian market and villages of Latacunga and Ambato—we'll overnight in Ambato. Our transfer from Quito to Guayaquil will give us a chance to see the country's remarkable scenery. Special attention will be paid to the unique bird life.

Our cruise ship, the 2,200-ton *M.V. Buccaneer*, meets the highest safety requirements. Originally designed to carry 250 passengers, it was refurbished in the United States in 1976 to carry only 90, and has recently been again refurbished. All cabins are outside and are equipped with complete private bath. The *Buccaneer* offers a comfortable, informal cruising environment. Although we'll be in the tropics, it will never be unpleasantly hot because of the cooling effect of the Humboldt Current.

The price is $3,550 (per person, double occupancy). We hope you will join us in one of the greatest adventures in travel.

Coming up...

Australia Tour
August 23-September 12

Kenya Tour
September 11-October 1

For additional tours, please turn page

Field Museum Tours for Members

Grand Canyon Adventure

May 22-30

An exciting 280-mile cruise down the Colorado River by motorized rubber raft, camping outdoors under the stars. Dr. Bertram Woodland, curator of petrology, will lead the tour. Group limited to 25. Details to be announced.

The Ancient Capitals of China

June 6-28

This unique itinerary, rarely granted by the Chinese authorities, includes the most significant sites of early Imperial China and will give an opportunity to explore in depth the civilization which characterized one of the oldest and longest-lived societies on earth. We will have the opportunity to observe the emergence of this remarkable culture and its development to a level which surpassed its contemporaries in the Western World.

June 6: Departure from Chicago to San Francisco in time for evening briefing.

June 7: Departure via Japan Airlines for flight to Tokyo.

June 8: Afternoon arrival in Tokyo; overnight at Nikko Narita Hotel.

June 9: Flight to Peking, where we will spend 4 days, visiting Imperial Palace, Temple of Heaven, Tien-an Square, and the antique shop district; Ming emperor tombs, the Great Wall, the Summer Palace, and the National Museum.

June 13: Overnight train ride to Zhengzhou, capital of Henan Province, where we'll spend 3 days; in addition to sight-seeing, we can rise early to participate in tai chi exercise groups in the People's Park.

June 16: A short train ride takes us east to Kaifeng, where we'll spend 2 days. The city is rarely visited by tourists; it's just at the beginning of modernization, and we'll get a wonderful feeling of Old China.

June 18: Two days in Luoyang, one of the oldest centers of Chinese culture.

June 20: A westward train ride takes us to Xian, our home for 4 days. This is where the fabulous clay horses and warriors of the "Great Bronze Age of China" exhibit were discovered.

June 24: We'll travel by air to Shanghai, where we will spend four days, including a one-day side trip to Souchou, silk-manufacturing center.

June 27: To Tokyo again, for a one-night stay before flying back to the States.

At a small additional cost, you may stay longer in Japan or in Hawaii, at completion of the China tour.

Our tour leader is Mr. Phillip H. Woodruff, Ph.D. candidate in Chinese history at the University of Chicago. This is Mr. Woodruff's third time as a Field Museum China tour leader and his fourth visit to that country in two years. Cost of the tour is $3,850 (per person, double occupancy).

Stanton R. Cook, courtesy *Chicago Tribune*

Alaska Native Culture Tour

June 19-July 1

This 13-day tour begins with a flight from Seattle to Sitka, Alaska, where we will spend two days and nights viewing old Russian settlement buildings, Sheldon Jackson Museum, and National Park Service exhibits. Our third, fourth, and fifth nights will be aboard two yachts, which will take us to Admiralty Island. We will see Tenakee Hot Springs, the native villages of Angoon and Hoonah, and make a tour of Glacier Bay.

Sightseeing in Juneau and its environs will be our activity during the next two days, followed by a day and night in Anchorage and a visit by motorcoach to Denali National Park (formerly McKinley National Park), where we will enjoy the spectacular scenery and view wildlife, spending two nights there. A day and a night in Kotzebue, a day in Nome, and a final day in Anchorage will round out the tour.

All hotel accommodations will be first class; the two yachts will accommodate 16 and 10 persons, respectively. Tour rates to be announced.

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

Field Briefs
Continued from p. 3

the donor's name and the donor's giving, as well.

Two brochures, "How To Remember Field Museum in My Will" and "How I Can Receive a Lifetime Income From My Gift to Field Museum," are available free upon request. Please write the Planned Giving Office, or telephone, (312) 922-9410 ext. 858.

Prairie Workshop

The Fifth Northern Illinois Prairie Workshop will be held on March 13 at the University of Illinois Chicago Circle Campus. Session titles will include Basic Concepts in Prairie Ecology, Prairie as a Constructed Landscape, Propogation of Prairie Flora, Presettlement Natural History, Prairie Management: Fire Ecology and Techniques, Prairie Preservation, Prairie Wildlife, Identification of Prairie Grasses and Sedges, Prairie Wetlands, Methods of Prairie Restoration, Linear Prairies, Esthetics, Prairie Protection, Cemetery Prairie Preservation, Prairie Interpretation, and Prairie Management: Alternatives to Burning. There will also be technical sessions. Further information may be obtained from Albert Rouffa, Department of Biological Sciences, University of Illinois Chicago Circle Campus, Box 4348, Chicago, Il 60680.

Solomon Gurewitz (1899-1981)

Solomon Gurewitz, a volunteer in the Department of Anthropology for some twenty years, died in September at the age of 82. Following his retirement in 1961 from a successful business career, Gurewitz came to Field Museum as a nearly full-time curatorial assistant—without pay.

Within a month Gurewitz had taken over responsibility for reorganizing one of the former Chinese storerooms. He cataloged, studied, found things for visiting scholars, packed, cleaned, selected things for loans, rearranged other storerooms, and helped set up exhibitions. He became expert in a number of branches of Far Eastern art and culture. He often gave lectures and advice to other students of those subjects.

About fifteen years ago, Gurewitz managed to convince the Museum that a very high priority should be given to making a photographic record of its collections. (Like most museums founded before film and cameras became cheap, we had never photographed or made drawings of more than a small percentage of our holdings.) He organized a departmental photographic studio with the help of the Museum photographer, relearned the needed skills (he had once run a small photo finishing business), and set out single-handedly on a task that had daunted several generations of Museum employees. He and several other volunteers have by now produced many tens of thousands of excellent pictures which have been duly filed and mounted on the backs of the catalog cards for those particular objects.

Gurewitz was the first of his kind, proof that a volunteer with the right attitude and skills could do the work of a museum professional. Field Musuem has established in his name a special fund for the purchase of Oriental and other anthropological objects. Contributions may be sent to the Vice President for Development. Checks should be made out to Field Museum with a note specifying that the gift is to be added to the Solomon Gurewitz Memorial Fund.

Tibet Lecture by Edwin Bernbaum

James Simpson Theatre
(West Entrance)
Sunday, February 21, 2:00 p.m.

To many, Tibet is a land of enchantment, a land of holy men, towering peaks and mystical legends. In this fascinating illustrated lecture, "Hidden Valleys of Tibetan Myth and Legend," author Edwin Bernbaum recounts the legend of Shambhala—the source of James Hilton's concept of "Shangri-La" in his novel *Lost Horizon*. Bernbaum explores Tibetan myths and legends relating to the mythical kingdom of Shambhala through slides and tape recordings he made in Nepal, India, and Sikkim.

Bernbaum has done extensive research in comparative religion and mythology. The Shambhala prophecies originate in a set of more than 300 volumes of ancient sacred texts called the *Kangyur* and *Tengyur*, which are for Tibetans what the Bible is for many Westerners. He has returned to Nepal four times to gather information and photograph ancient texts and artworks. On one of his early trips, Bernbaum met the Incarnate Lama of Tengboche monastery, who knew of Shambhala—a place where, legend states, the best of Western and Eastern culture—science, literature, music, art—is preserved for the future.

On a later visit, Bernbaum learned of a secret valley in the Himalayas not far from Mount Everest. It was said to have everything a person would need to live as well as spiritual treasures which would lead to enlightenment. He led a climbing expedition over snowy mountains, steep passes, and glaciers to find it. It was the Khembalung Valley. Carpeted with rhododendrons, it had a beautiful river which flowed through meadows and pine forests.

Author of "The Way to Shambhala," Bernbaum is a graduate of Harvard University where he was president of the Mountaineering Club. He is currently pursuing his doctorate in Asian Studies at the University of California at Berkeley.

Admission to the lecture is $3.00 for Members and $5.00 for nonmembers. Additional information is available by calling 322-8854.

Tengboche Monastery, where Edwin Bernbaum first learned of Shambhala. Photo by Edwin Bernbaum.

ELIZABETH BEST DEIS
721 SIMPSON
EVANSTON ILL 60201

February & March at Field Museum

February 16 through March 15

New Exhibits

"Maritime Peoples of the Arctic and Northwest Coast." Opening April 24 in Hall 10. Plan now for the opening of this spectacular new permanent exhibit, the biggest project of its kind ever undertaken by Field Museum. The 15,000-square-foot exhibit will compare and contrast the life and culture of the Northwest Coast Indians and the Eskimos. Many of the 2,500 articles to be displayed came from the original Columbian Exposition of 1893, but the design concepts used by Field Museum's Exhibition Department incorporate all the newest techniques. The *Learning Museum* course beginning in February and the *Lecture Series* in March have been planned to deepen the visitor's appreciation of the exhibit.

Continuing Exhibits

"In the Shadow of the Pyramid." Stand inside the walls of history in this new permanent exhibit area of the "Hall of Ancient Egyptians." You may now enter tomb chapel rooms built more than 4,000 years ago and a replica of the chapel of Nakht on loan from the Metropolitan Museum of Art. You may also view exhibits detailing life in prehistoric and early historic eras of Egypt and photomurals explaining how the tomb chapels came to Field Museum. Hall J, Ground Floor.

New Programs

"Hidden Valleys of Tibetan Myth and Legend." Edwin Bernbaum tells of his search for the legendary Tibetan kingdom of Shambhala in a lecture illustrated with authentic slides and tapes on Sunday, Feb. 21, at 2 p.m. in James Simpson Theatre. This kingdom is the mystical basis of Tibetan religion and the inspiration for James Hilton's novel, *Lost Horizon*. Bernbaum, author of *The Way to Shambhala*, takes us to a hidden valley high in the Himalayas that he discovered through studying ancient texts and personal contact with a Tibetan Lama. This perilous journey symbolizes the search for the mythical kingdom of Shambhala as well as a psychological search for the inner self. Members: $3.00. Nonmembers: $5.00. For more information, call 322-8854.

Northwest Coast Lecture Series. "A Culture Develops." Four Friday evening lectures by authorities on native cultures of the Northwest. Beginning at 8 p.m., these individually complete lectures are designed to deepen the viewer's appreciation of the new permanent exhibit, "Maritime Peoples of the Arctic and Northwest Coast." Entrance for the 8 p.m. lectures will be through the West Entrance. Members: $3.00. Nonmembers: $4.00.

March 5: "First Peoples of the North Pacific," K.R. Fladmark, Simon Fraser University.

March 12: "Pre-historic Peoples: Conquest of the Region," Don E. Dumond, University of Oregon.

Edward E. Ayer Film Lecture Series. These popular travel films narrated by the filmmakers are shown every Saturday at 1:30 p.m. in James Simpson Theatre during March and April. The first film of the spring series will be Tom Sterling's "Newfoundland," on March 6. The second feature will be "Switzerland" by Ric Dougherty, on March 13. For other films in this series see p. 19. The 90-minute films are free. Admission is through the West Door. Members receive priority seating.

Weekend Discovery Programs. Tours, craft projects, slide presentations, and films which use Field Museum exhibits as a springboard for new insights into natural history topics. Check *Weekend Sheet* available Saturday and Sunday at Museum entrances for programs and their locations. February's programs highlight the cultures of the Himalayan area in conjunction with the lecture "Hidden Valleys of Tibetan Myth and Legend." March's "Film Features" are about mammals from around the world.

Feb. 20	1:00 p.m. *Himalaya: Life on the Roof of the World*. A "Film Feature." 1:30 p.m. Tibetan Life and Religion. Slide lecture and tour.
Feb. 27	1:00 p.m. *Tibet* and *The Royal Dancers and Musicians of the Kingdom of Bhutan*. Two "Film Features" shown consecutively. 2:00 p.m. Costumes for the Sorcerer's Dance. Tour.
March 6	1:30 p.m. *Mzima: Portrait of a Spring*. "Film Feature" about animal life around a spring in Kenya.
March 13	1:30 p.m. *Wolves and Wolfmen*. A "Film Feature."

Continuing Programs

Volunteer Opportunities. Persons with scientific interests and backgrounds are needed to work in various Museum departments. Contact the Volunteer Coordinator, 922-9410, ext. 360.

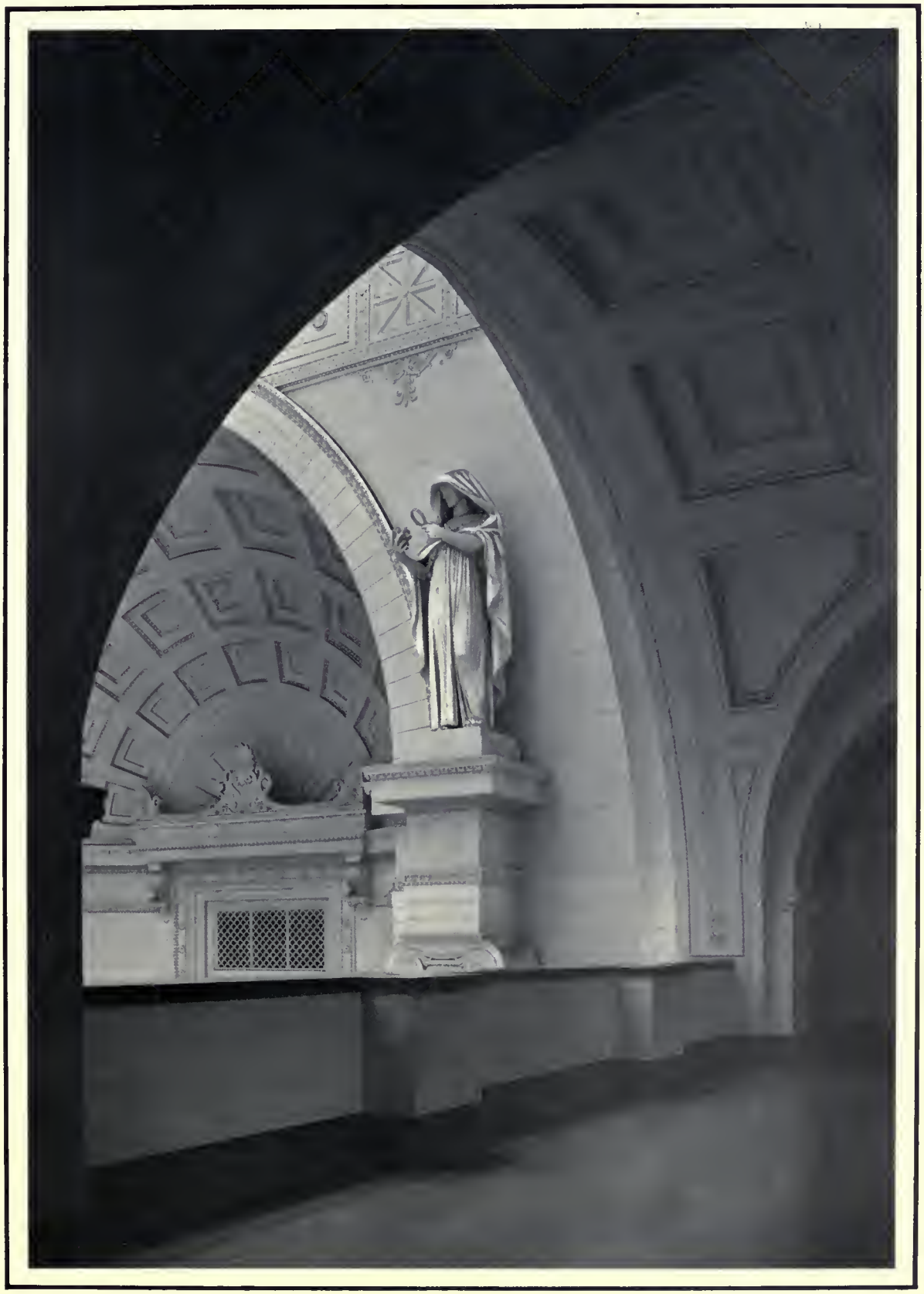
February and March Hours. The Museum is open 9 a.m.–4 p.m., Monday–Thursday (until 5 p.m., beginning March 1); 9 a.m.–9 p.m., Friday; and 9 a.m.–5 p.m. Saturday and Sunday.

The Museum Library is open weekdays 9 a.m.–4 p.m. Obtain a pass at the reception desk, main floor. Closed February 15 and March 15.

Museum Telephone: (312) 922-9410

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

March 1982



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COVER

The Muse of Geology, in all her 8 1/2-foot splendor, is framed by arches at the south end of the second floor's west balcony. The regal figure is one of four, at each corner of Stanley Field Hall, and is the work of Henry Hering (1874-1949), a New York sculptor who studied under the famed Augustus Saint-Gaudens. Neg. 79869. For more on the architectural delights of Field Museum see "Field Museum as Architecture," by William Burger, p. 3.

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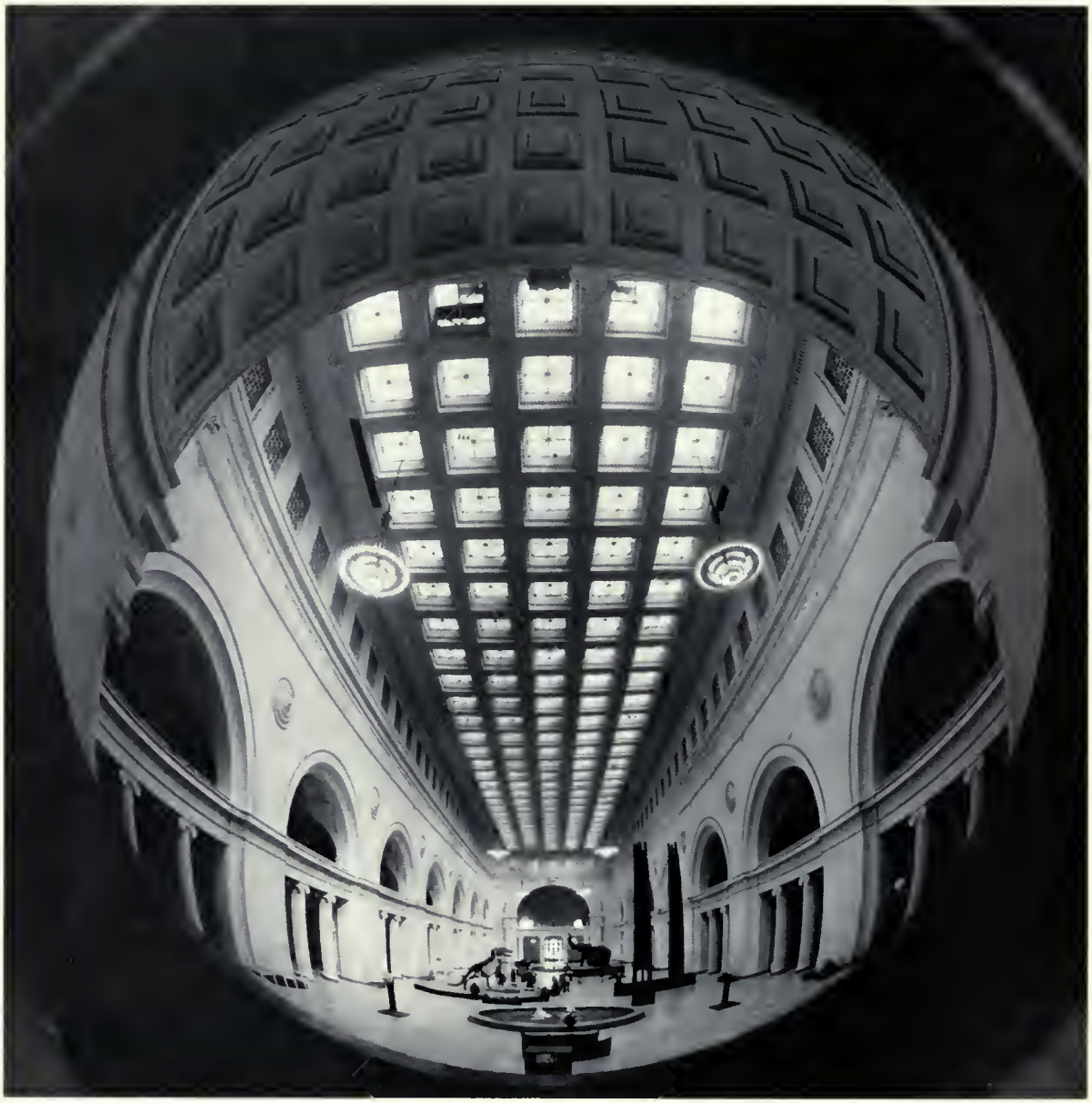
FIELD MUSEUM AS ARCHITECTURE

By WILLIAM BURGER
Chairman, Department of Botany

I have always felt a special fascination for large or unusual buildings. The fact that I grew up in New York City accounts for some of this interest; but it was an introductory college course in the history of architecture, followed by a year and a half in Europe that really got me hooked on the form and structure of buildings. So you can understand my delight in working within the superb edifice that houses the Field Museum of Natural History.

Ours is one of the world's largest museum buildings, structurally completed in 1920 and covering an area of some 700 by 440 feet; it is also unusual in that it has not grown by the accretion of new wings or additions—ours is a single, unified structure. The colonnaded exterior and well proportioned symmetry help to unify the building's huge dimensions. The elevated base, framed within a terrace, adds to the building's stature in its parklike setting. While

Southward view along east balcony, second floor



Stanley Field Hall through fish eye lens. Photo by William Burger

the exterior is impressive, the most dramatic aspect, for me, is within. Passing through the large Ionic columns and bronze doors into Stanley Field Hall is an awesome experience. The great size of the central hall, its carefully proportioned arcades and columns, the rich decoration in low relief, and the multifaceted skylight create a magnificent interior space.

There is something else I have found unusual about our building: a great many books on the architecture of Chicago and the Midwest make no mention of the building or its central hall. Even a recently published encyclopedia-like volume on architecture in the Midwest and the South includes McCormick Place, the Museum of Science and Industry, the Water Filtration Plant, and other Chicago buildings, but it fails to include Field Museum. Why is it that Field Museum and Stanley Field Hall have been so ignored?

The answer may be that our building has the "wrong religion." It is a neoclassical structure in a city where new and indigenous architectural directions were forged. Chicago's new buildings were part of an effort to break away from the neoclassical style and to blaze new trails. For most of this century, architects and those writing about architecture have been so deeply immersed in the esthetics of Chicago's bold new architecture that our neoclassical buildings have been all but ignored.

Our building is eminently functional. Grand symmetrical stairways serve traffic flow between the two major exhibit floors; eight smaller stairwells (four in the corners and four near the center) interconnect all four main floors. The general exhibit halls conform to the rectangular shape of the building in an easily understood and symmetrical pattern, with the largest halls at the east and west ends. The halls

range from 14 to 22 feet high, and the smaller halls, of which there are 26, average 8,000 square feet in area. Skylights and lightwells were part of the building's original design, but since even indirect sunlight is damaging to many materials, this light source is no longer used for exhibits. This has permitted "filling" the lightwells with as many as four floors for additional specimen-storage and research space. The great strength of the piers, in what is essentially a masonry building, permitted the additional load and in the past decade about 100,000 square feet of floor space were added to the building's original 775,000. Thus, both our public areas and the research/specimen-storage areas can be measured in acres. So it is eminently clear that our building is unusually large as well as very functional; but do we have one that merits more serious consideration as a major architectural structure?

The exhibit halls on the first and second floors are separated from the central hall by broad walkways, delimited by Ionic columns on the first floor and with arcades on the second. These walkways prevent the exhibits from intruding into the central hall and, I believe, it is this central space in particular that makes our building something to brag about. The large volume of the hall (70 feet wide, 75 feet high, and 300 feet long), the white interior, and ample skylights produce an almost luminous quality.

Much of the ornamentation in the hall is quite subtle, providing a variety of textures without intruding into the space. With the elephants, totem poles, and dinosaur skeletons set off to the side, the hall retains its open spaciousness. (In older photographs of Stanley Field Hall with the elephants placed centrally and with a clutter of small exhibits the hall appears more confining.) The fountains add a steady pleasant sound, masking minor noises and helping visitors in adjacent exhibit halls to orient themselves. These aesthetic features and the grand scale are not the whole story; this is functional architecture. Stanley Field Hall is the geographic center of the main exhibit floors; it is both the starting point and terminus for most museum visits.

Occasionally, I like to look down from the second floor balcony and watch the reactions of apparent first-time visitors. Many of them stop dead in their tracks shortly after entering our central hall. Then their heads begin to turn around like radar antennas, taking it all in. The impact of a great room, like any work of art, can be a deeply moving experience. One has a similar reaction in the Pantheon of Rome, the Gothic cathedrals of France, and richly decorated rococo churches of southern Germany.

When you enter a building with an exceptional interior space, you know it. The size, luminosity, and strong symmetry of Stanley Field Hall together create the kind of impact that can be experienced in few other buildings.

Some of the world's most famous architectural landmarks have very little enclosed space —the great mausoleums in particular, such as the Taj Mahal and the Pyramids of Egypt. But many famous buildings are noted primarily for their internal spaces. If the creation of interior space is one of the measures of a great building —then we do indeed have a great building. Now that there is greater interest in architectural styles that have been long out of favor, perhaps we can expect greater appreciation of our building. The latest edition of *Chicago's Famous Buildings* (edited by Ira J. Bach, 1980) not only includes Field Museum for the first time but also refers to Stanley Field Hall as "one of the most impressive monumental interior spaces in Chicago." I see no reason to be so provincial. Why not call it what it is: one of the finest large interior spaces in the world? □

Stately Ionic columns at south end of Stanley Field Hall

Field Museum Tours for Members

Stanton Cook, courtesy of *Chicago Tribune*

Young China welcomes you

The Ancient Capitals of China

June 6-28

THE UNIQUE ITINERARY, rarely granted by the Chinese authorities, includes the most significant sites of early Imperial China and will give an opportunity to explore in depth the civilization which characterized one of the oldest and longest-lived societies on earth. We will have the opportunity to observe the emergence of this remarkable culture and its development to a level which surpassed its contemporaries in the Western World.

June 6: Departure from Chicago to San Francisco in time for evening briefing.

June 7: Departure via Japan Airlines for flight to Tokyo.

June 8: Afternoon arrival in Tokyo; overnight at Nikko Narita Hotel.

June 9: Flight to Peking, where we will spend 4 days, visiting Imperial Palace, Temple of Heaven, Tien-an Square, and the antique shop district; Ming emperor tombs, the Great Wall, the Summer Palace, and the National Museum.

June 13: Overnight train ride to Zhengzhou, capital of Henan Province, where we'll spend 3 days; in addition to sight-seeing, we can rise early to participate in tai chi exercise groups in the People's Park.

June 16: A short train ride takes us east to Kaifeng, where we'll spend 2 days. The city is rarely visited by tourists; it's just at the beginning of modernization, and we'll get a wonderful feeling of Old China.

June 18: Two days in Luoyang, one of the oldest centers of Chinese culture.

June 20: A westward train ride takes us to Xian, our home for 4 days. This is where the fabulous clay horses and warriors of the "Great Bronze Age of China" exhibit were discovered.

June 24: We'll travel by air to Shanghai where we will spend four days, including a one-day side trip to Souchou, silk-manufacturing center.

June 27: To Tokyo again, for a one-night stay before flying back to the States.

At a small additional cost, you may stay longer in Japan or in Hawaii, at completion of the China tour.

Our tour leader is Mr. Phillip H. Woodruff, Ph.D. candidate in Chinese history at the University of Chicago. This is Mr. Woodruff's third time as a Field Museum China tour leader and his fourth visit to that country in two years. Cost of the tour is $3,850 (per person, double occupancy).

COMING UP...

Australia Tour
August 23-September 12
(details to be announced)

Coral Reef Biology and Natural History Explorations in the Western Caribbean

June 22-July 11

THE RICHNESS OF MARINE LIFE and the beauty of the offshore reefs and islands of Belize and Honduras are unsurpassed in the Atlantic tropics. Field Museum's 20-day tour of this region offers a unique opportunity to explore and study tropical marine and terrestrial ecosystems and, if desired, to earn university credit for doing so. Leading the tour will be three professional marine biologists, each with considerable field work in the Gulf of Honduras and well acquainted with the local flora and fauna.

Included in the tour is a six-day stay at Glovers Reef, 28 miles offshore from Belize. Reef formations at Glovers are among the Caribbean's most richly developed. Lectures and field-trips, including snorkeling, will familiarize participants with the mammals, invertebrates,

---

COMING UP...
Kenya Tour
September 11-October 1
(details to be announced)

Left: Kenya lion captured by camera lens of Audrey Faden, Kenya tour leader/lecturer

fishes, sea birds, and algae of this isolated, untouched coral-reef. Daily scuba diving is available. The 50-foot motor sloop *Christmas Bird* will take us to and from the reef, where we will stay at Lomont's Glovers Reef Village resort

Our stay at Glovers will be followed by a four-day indepth exploration of the central Belize mainland, including rain forests, the famed Blue Hole on the Hummingbird Highway, a stay at the Blancanaeux Lodge atop Mountain Pine Ridge, a visit to Rio Frio Cave and the Thousand Foot Falls, and exploration of Mayan ruins at Xunantunich. Aiding us for the four days will be Belize resident Dora Weyer, internationally known naturalist and expert on bird identification.

We will then stay five days at Roatan, one of the Bay Islands, where steep cliffs, rocky shores, and sandy beaches and associated wildlife provide a sharp contrast to the Glovers atoll environment. At Anthony's Key Resort, our Roatan home, first class accommodations, scuba facilities, fantastic sport fishing, tennis, etc., and superlative surroundings will add to our enjoyment. The tour will end with a day at San Pedro Sula, on the mainland, with sight-seeing and shopping or a tour to Mayan ruins at Copan.

Leading the tour will be Dr. Robert Karl Johnson, curator of fishes and chairman of Field Museum's Department of Zoology; Dr. David W. Greenfield, research associate in the Museum's Division of Fishes and professor of biological sciences at Northern Illinois University (NIU), and Dr. Norman A. Engstrom, associate professor of biological sciences at Northern Illinois University. Three semester hours of undergraduate or graduate credit in biological sciences are available from NIU to tour participants. The tour will be limited to 10 participants. The price is $2,385, from New Orleans (per person, double occupancy).

Belize highlands

Grand Canyon Adventure

May 21-30

Many of us have beheld the Grand Canyon from the rim or while flying overhead, and some of us have hiked partway down to the Colorado River. But there is another Grand Canyon that relatively few have experienced: Field Museum is offering you the opportunity to see and experience the canyon from the river.

The 280-mile trip will be by two motorized rubber rafts. We'll sleep on sandy beaches under the stars and our meals will be excellent. Along the way, we'll hike to places of unusual geologic and anthropologic interest, sometimes through the most pleasant and enchanting stream beds and valleys, at times along waterfalls. We'll see and study more geology in this one brief period than can be seen anywhere else in comparable time. Dr. Bertram Woodland, curator of petrology, will be our tour leader.

The trip will begin on Friday, May 21, with a flight to Las Vegas, where we will remain overnight. The evening of our arrival, we'll have a briefing about the river trip and will receive our river equipment. Saturday morning we'll leave by deluxe bus for Lees Ferry, where we'll board the rafts. The trip will end 9 days later, at Pierce Ferry, near the head of Lake Mead. We'll return to Chicago, via Las Vegas, Sunday, May 30.

You needn't be a "rough rider" to join this expedition—you needn't even know how to swim. Persons of any age can enjoy the river with equanimity, and come out proud and happy to have experienced this extraordinary adventure.

The cost of $1,500 per person covers all expenses (including air fare, boat fees, waterproof bags for gear, sleeping bags, etc.), and all meals. The trip is limited to 25 participants.

Shooting rapids of Grand Canyon's Colorado

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

COURTESY THE AMERICAN MUSEUM OF NATURAL HISTORY

HOUSES
Of The Maritime Peoples
Of The Northwest Coast

Kwakiutl village of Xumtaspi-Nahwitti, Hope Island, B.C., 1884. The village location—between a beach and a thick forest—was typical. Signs above the doors read: "CHEAP. The home of the head chief of al tribes in this country. White man can get information," and "BOSTON. He is head chief of Naweety [Nahwitti]. He is true and honest. He dont give no trouble to no white man." Lone U.S. (?) sailor stands in front of center structure.

by DANIEL J. JOYCE

Staff Member of the Maritime Peoples of the Arctic and Northwest Coast Project

New permanent exhibit "Maritime Peoples of the Arctic and Northwest Coast" opens to public in Hall 10 on April 24

When plans were made a few years ago for a new permanent exhibit at Field Museum on the Maritime Peoples of the Arctic and Northwest Coast, it was clear that the magnitude and comprehensiveness of the projected exhibit required the inclusion of a Northwest Coast house. (Such houses had been on view nearly 90 years earlier at the World's Columbian Exposition, but were now no longer available.)

Tony Hunt, a well known Kwakiutl artist and a resident of British Columbia, was commissioned to build in Hall 10 the rear portions, in cutaway fashion, of two Kwakiutl houses. They were to be replicas of the type built by the Kwakiutls in the

Early view of Kwakiutl house frame through camera lens of Edward S. Curtis. Side beams are exceptionally large.

latter 1800s, and represent the same house as arranged during the secular and sacred seasons. Calvin Hunt, Tony's cousin, and colleague John Livingston, assisted Tony.

The two impressive structures (15 feet high, 22 feet wide, 11½ feet deep) are set against the east wall of the hall. That on the left, representing the interior during the secular season, is furnished with conventional household articles of the nineteenth-century Kwakiutl and is fronted with glass somewhat in the fashion of a diorama. The house to the right, designed as a walk-in exhibit, shows an interior arranged and partially furnished for ceremonial activities during the sacred season. Here volunteers will talk with groups about the culture of the Northwest Coast Indian.

Each house[1] features two house posts[2] carved with ravens, the principal crest of Tony Hunt's family, and mythological sea grizzly bears holding human figures. The ceremonial house has a three-section wooden dance screen[3] decorated with a stylized sea monster and ravens.

The typical Northwest Coast dwelling, made of cedar planks, housed a large extended family and its possessions. In villages situated on beaches, the houses were commonly arranged in a single row, facing the water: canoes were

COURTESY THE AMERICAN MUSEUM OF NATURAL HISTORY

1. Cat. 264017, 264018
2. Cat. 264017A, B; 264018A, B
3. Cat. 264019A, B, C

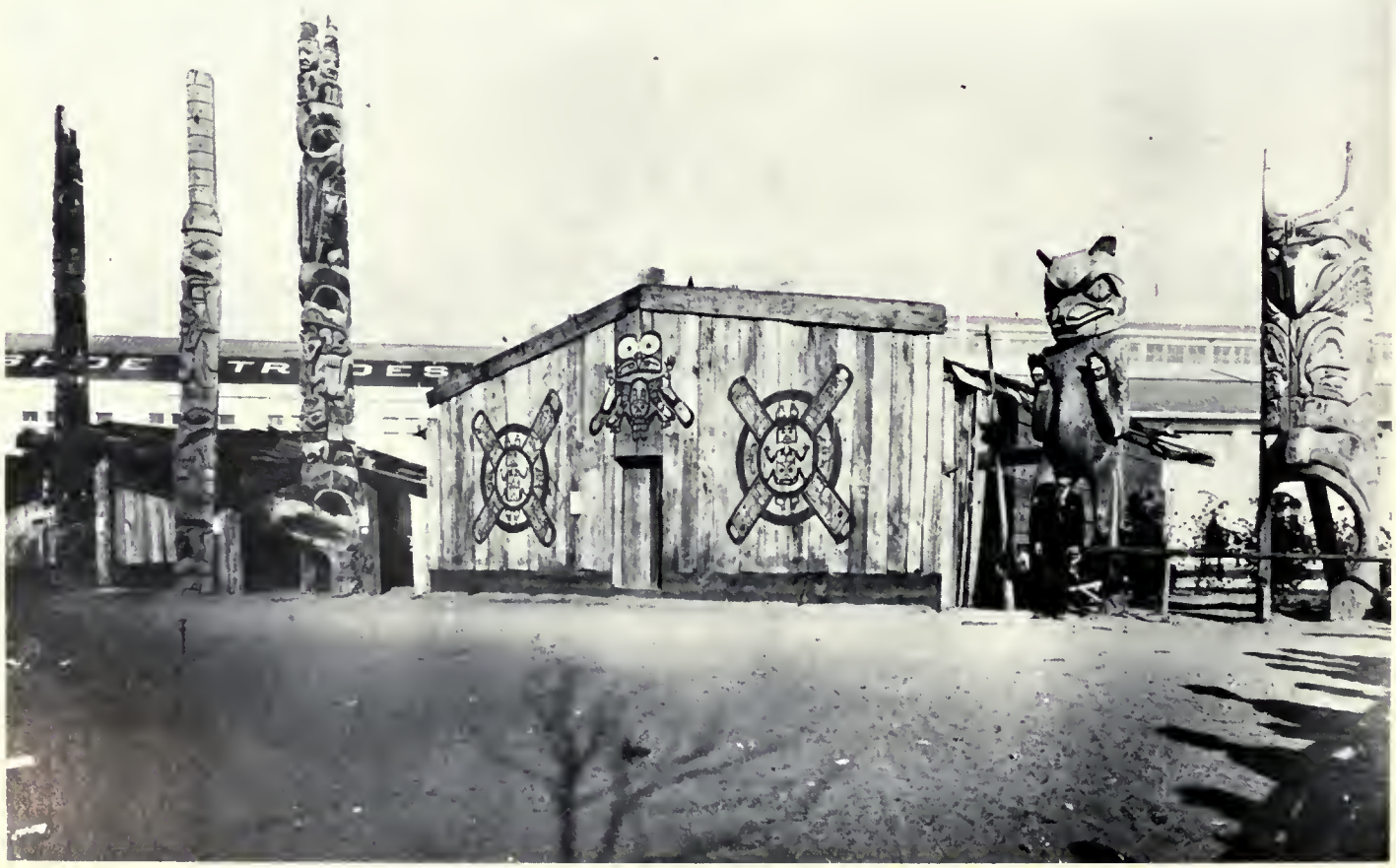
COURTESY THE AMERICAN MUSEUM OF NATURAL HISTORY

beached literally at the doorstep. The houses of larger villages (populations ranged from 50 to 1,000) were often in two or three rows, the front row for families of highest social ranking and the back row for the lowest ranking. Sweat houses, smoke houses, grave houses, and huts for women during menses were also in the back row.

On the northern portion of the Northwest Coast, houses averaged about 30 by 45 feet in size; those further south were generally larger, often measuring more than 60 by 90 feet. Throughout the area, elaborately carved totem, mortuary, and memorial poles were commonly installed in front of the larger houses, with carved house posts inside as well. Horizontal beams within the house were adzed in decorative linear designs.

The exterior front of the house was sometimes painted with the figure of that animal (commonly a raven, bear, beaver, or whale) associated with its most prestigious member; in

__Left and below,__ Northwest Coast Indian houses at 1893 exposition in Jackson Park, Chicago. __Left:__ Dugout cedar canoes beached on shore of what is today Jackson Park Lagoon. __Below:__ House at left shows northern style of Haida. House at right, from village of Nahwitti, B.C., shows Kwakiutl southern style, with both vertical and horizontal planking. Totem pole third from left (now on view in Stanley Field Hall) has opening that served as doorway when set against house. Remaining totem poles will be seen in Hall 10, opening in April.



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COURTESY THE AMERICAN MUSEUM OF NATURAL HISTORY

Kwakiutl village on Salmon River, B.C., 1881. The incomplete house second from the left shows main beam structure with latticework partially installed. Two houses to right show both the older horizontal and the newer vertical wall planking.

some cases the animal's mouth was an actual opening that served as the house entrance. The mouth of the lowest figure on a totem pole, sometimes set flush to the house, was carved through to the other side for the same purpose. Since permanent paints were unknown to the Indians before the arrival of the Europeans, it has been suggested that painted house facades were removable, and set up only for ceremonies; this changed after more durable paints became available.

Two basic types of house were constructed throughout the coastal area, one type by the Tlingit, Haida, Tsimshian, and Haisla-speaking Kwakiutl on the northern section of the coast, and a second type in the southern portion by the remaining Kwakiutl, Bella Coola, and Nootka. The northern type was rectangular and gable-roofed, with vertical planks for walls. These northern houses often had mortised joints, forming a highly stable, durable structure.

The vertical wall planks were set into slotted horizontal planks at both the top and bottom. The horizontal members were fastened to house posts. A roof opening let light in and served as a smoke hole. The floor was dug out, leaving a wide bench to run along the inside walls. Cedar plank rooms on top of the bench were like miniature houses. The room of a less affluent family was made of cedar bark matting on a pole frame rather than of solid wood. The most prestigious member's room was at the rear center of the house, near the two house posts. Next to his, at the rear and around the sides toward the door, were those of members whose status was progressively lower; the quarters of slaves (captives from other tribes) were at the front near the entrance.

For ceremonial occasions, the interior was greatly altered. Family partitions were taken down, and a central hearth was made available to all, instead of one hearth for each family. An

RON TESTA

elaborately painted, wooden dance screen was placed between the posts at the rear of the house. The area behind the screen, where only the initiated could enter, was held as sacred. The dancers entered and left through a round hole in the screen. The entire setting was conducive to and appropriate for elaborate ceremonies.

Houses on the northern and southern sections of the coast were similar to one another in appearance, but differed in structure. In the south, three or four heavy upright posts supported low-pitched gable roofs. Large posts supported a heavy single or double ridgepole, around which a latticework of smaller poles was constructed. Wall and roof planks of cedar were attached to these poles to form the outer sheathing, but in such a manner that they could be taken down when the time came for the family's seasonal move.

The wall planks were lashed to upright pairs of poles near the house corners. In the south, northern-style vertical planking construction eventually came to replace the horizontal style. The vertical poles were then no longer necessary, and often the top of the vertical planking was nailed in place to a horizontal pole running along the top.

With the waterways as their main avenues of transport, many villages were located on inlets or on rivers. Here they had protection from ocean winds and better access to fresh water and resources of the forest. Some coastal tribes had summer villages on the coast and winter villages farther up the rivers and inlets. When traveling to exploit seasonal goods, they moved their houses or built temporary shelters of mats.

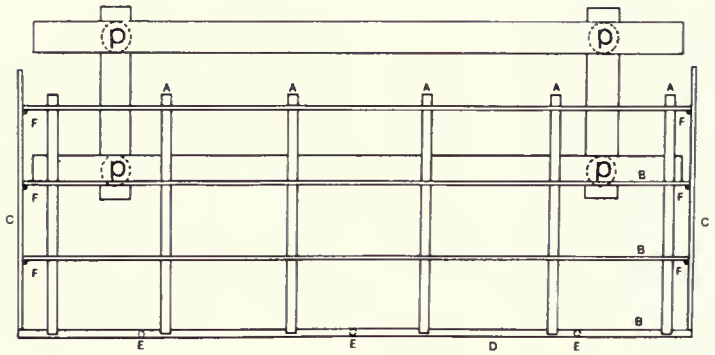
When it was time for the seasonal move, the house sheathing was often attached to two canoes that were tied side by side, for transport to the new homesite; the main post structure remained in place to be used again in the future.

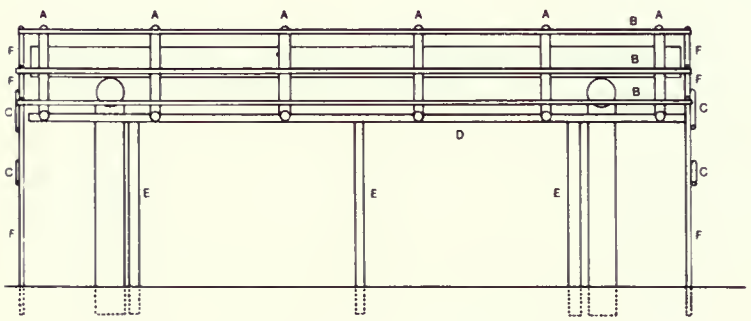
Still further south, the coastal Salish and other groups in northwest Washington built houses similar both in construction and appearance to those of their neighbors immediately to the north, but with a shed-style, or single-pitch, roof. The outer sheathing was separate from the heavy posts, and the entrance was on the long side rather than at the narrow end of the house. Benches were again built around the inside, but the floor was not excavated; facades remained unpainted. Light was admitted and smoke let out through a hole that could be adjusted by pushing roof boards back or forth with a pole.

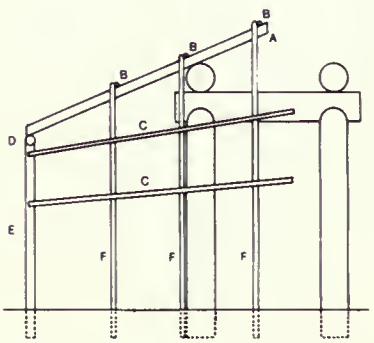
Ceremonial house (cutaway) designed and built by Kwakiutl artist Tony Hunt, with dance screen. Designed as a walk-in exhibit, the structure is nearly full-sized replica of 4-post, vertical-planked dwelling of late 1890s. Next to it has been built a similar cutaway, fronted with glass, showing artifacts of daily life.

Either end of the house could be extended by simple, incremental additions. The remarkable house of Chief Seattle (1786?-1866), of the Suquamish, was extended to a total length of 900 feet.

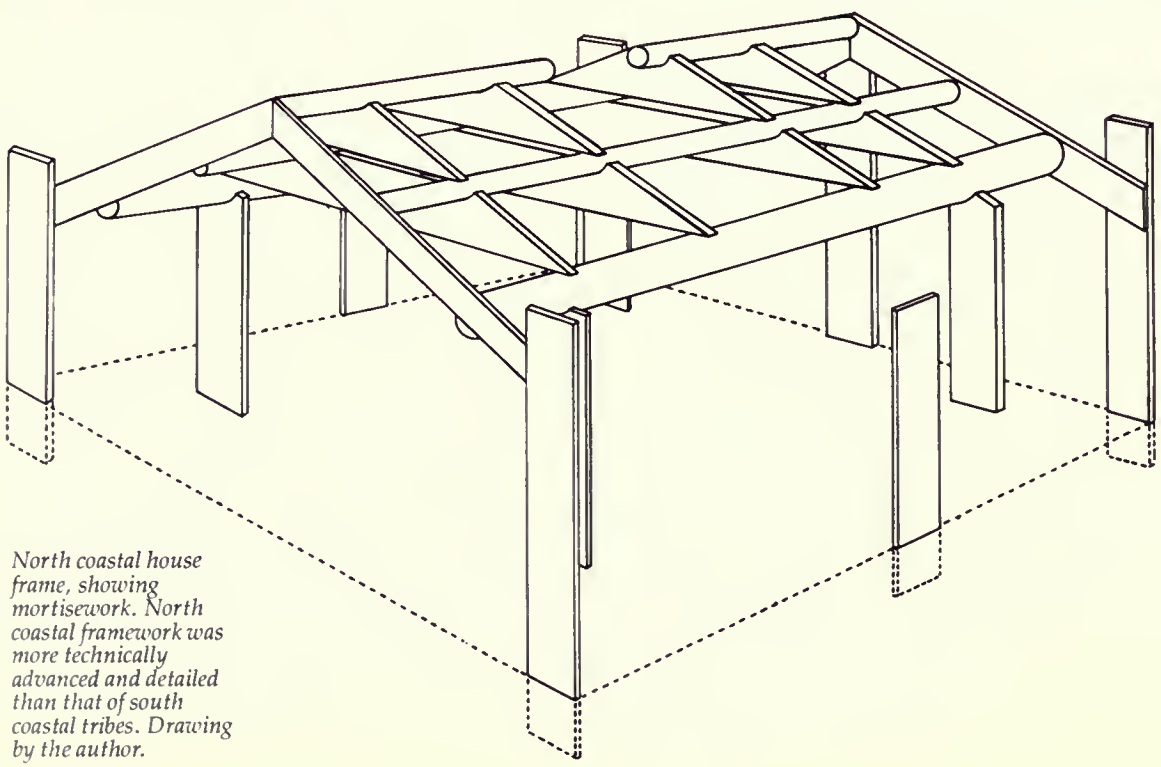
As Europeans settled on the Northwest Coast, their influence was reflected in the style of native houses. Windows, hinged doors, and European-style furniture came into vogue. In time, the traditional dwelling of the Northwest Coast peoples gave way to the conventional frame house of the White settler. □







South Coastal House: framework details. Left, above: *Top view of house, showing 4-post (P), main beam structure, with latticework (below) partly rendered.* Left below: *Side view.* Below: *End view. In this part of the coast a latticework of small poles was built around the main beam framework to lend added support to the walls and roof. The latticework and the outer sheathing of cedar planks were removable. Drawings by the author.*



North coastal house frame, showing mortisework. North coastal framework was more technically advanced and detailed than that of south coastal tribes. Drawing by the author.

ALASKAN

NATIVE CULTURE TOUR FOR MEMBERS

June 18-July 2

June 18: Fly from Chicago to Anchorage, transfer to Sheraton Anchorage Hotel. City tour, including Fine Arts Museum, then dinner at historic Club 25. Overnight Sheraton Anchorage Hotel.

June 19: Flight to Kotzebue, with day tour and overnight first class hotel.

June 20: Depart for Nome; day tour of Nome. Depart for Anchorage; overnight Sheraton Anchorage Hotel.

June 21: Depart early morning by motorcoach to Denali National Park (formerly McKinley). Afternoon and evening free for National Park Service slide shows and demonstrations, overnight first class hotel in park.

June 22: Early morning wildlife tour in park; early afternoon motorcoach to Fairbanks. Overnight Captain Bartlett Hotel.

June 23: Special tour and lecture for Field Museum by University of Alaska, on ivory and totem carving, agriculture, permafrost construction, oil development, economic situation, etc. Overnight Captain Bartlett Hotel.

June 24: Fly Fairbanks to Whitehorse. Yukon River raft trip and outdoor BBQ dinner. Overnight at Travelodge.

June 25: Day-long trip on narrow-guage railway to Skagway. Free time to sightsee, then to Klondike Hotel for overnight.

June 26: 5-hour boat curise to Juneau; to Baranof Hotel for overnight, with stop at Mendenhall Glacier enroute. Late afternoon walking and van tour, including historic district, gold mine, government buildings; outdoor salmon bake dinner. Overnight Baranof Hotel.

June 27: Morning tour of Alaska State Museum. Afternoon program on Alaska Native Land Claims Settlement Act and current native economic conditions. Board cruise ship *M.V. Statendam* in late afternoon. Meals on board begin with dinner. Cruise ship departs 11:00 p.m. (*Statendam* is 25,000-ton luxury liner.)

June 28: Day of cruising on Glacier Bay; lecture room provided to the group.

June 29: Port of call: Sitka. Special tour of Sheldon Jackson Museum, National Park Service exhibits, totem collection, Russian Orthodox church, Baranof Castle site.

June 30: Cruising off British Columbia coast.

July 1: Arrive in Vancouver by *Statendam* in morning. Special tour of Vancouver, highlighting Northwest Coast Indian art; overnight Bayshore Inn.

July 2: Fly from Vancouver to Chicago.

This tour is limited to 30 persons (double occupancy), and includes for the tour price of $3,700 (single supplement: $400) a lecturer and escort; all lodging, sightseeing, and transportation; best hotels available in each city; class D, E, and F outside cabins on the cruise ship; meals in the itinerary plus all breakfasts and all meals on the *Statendam*; all ground tours and transfers in exclusive vehicles and specially done for the Field Museum group with 30 participants. With 15-29 participants, tours will be done exclusively, but transfers may be combined with other travelers.

Our tour leader will be Dr. Margaret B. Blackman, associate professor of anthropology at SUNY-College at Brockport, New York, an authority on native cultures of the Northwest Coast and Alaska.

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

ARTS OF TIDE AND TUNDRA

An Arctic and Northwest Coast Perspective

An Alaskan Eskimo wooden mask from Point Clarence, Alaska. This carving exemplifies the freedom of form that characterizes Eskimo art. The Alaskan Eskimo frequently employ masks in dances and other ceremonies. Regarded as repositories of spirit power, masks were often destroyed after being used. Cat. 12938.

By ROBERT STEVEN GRUMET
Northwest Coast Specialist
and
ANTHONY PFEIFFER
Project Coordinator

Made possible by a grant from the National Endowment for the Humanities, a federal agency

The land and the people of the far northern shores of North America have moved as one to the beat of wind and wave for countless generations. Long summer days, even longer winter nights, the ebb and flow of tide and pack ice, snow and rain, the annual migrations of caribou, salmon, seal and whale, have all set the tempo of Eskimo* and Northwest Coast Indian life. The people of these regions have always swayed in harmony with the varied rhythms of their lands. Nowhere is the essence of this relationship between people and their environment

**The word "Eskimo" comes from the Algonkian "eaters of raw flesh." The Canadian Arctic people prefer to call themselves* Innuit, *which means "people" in their language. Most Alaskan Arctic people continue to call themselves Eskimos.*

more apparent than in the artistic traditions of the people of the Arctic and North Pacific Coast.

Wide expanses of sheet ice, open water, and barrenlands; dark arctic nights, and the pale luminosity of the polar sun find expression in the free flow of light and form in Eskimo art. Brightly colored, highly abstract, and simply drawn images stand out starkly against solid color backgrounds. White is a highly favored background color, reminiscent of snow. Scenes of everyday life, supernatural visions, images of animals and physical features are drawn with a sharpness that mirrors the Eskimo experience of their land.

While we require a plane or horizon line, linear perspective, and a vantage point from which to measure distance, the Eskimo view the world as a dynamic, highly changeable place. Bright days suddenly plunge into darkness; clear weather transforms into blizzards in an instant. People sleeping beside an open water bay awaken to an ice sheet. Sometimes blinded by fog and snow, Eskimo people use other senses to navigate. Wind blowing from over salt water smells different from that blowing from over fresh water. The direction of the wind at a particular season or under particular conditions also reveals its source. Touches of wind and the smells of ice or land forms are Eskimo navigational aids.

The Eskimo spend much of their time on the heaving surfaces of pack ice and open water and, thus, do not orient themselves upon flat, stable surfaces. Their art mirrors this perspective. Carvings, for example, are not restrained by pedestals, and drawings do not have fixed vantage points. The objects seem to float in space. Most Eskimo sculpture is not free standing and falls over when placed upon a level surface. Thus, the meaning and the aesthetic aspects of an object are defined by its own physical form instead of by its relationship to other objects.

The lush forests, snow-capped peaks, mild climate, and teeming rivers of the Northwest Coast contrast sharply with the Eskimo environment. The North Pacific coast is a complex and abundant land. Mountains and forests fill the sky; aquatic life fills the waters; and fog, rain, and clouds fill the air. In former days, densely populated Indian villages and camps filled the sheltered beaches and river banks. A world rich in resources and people is reflected in a lavish and active art. Decorations cover all significant objects. Blankets, harpoons, houses, hooks, bowls, and baskets are carved, painted, or embroidered all over their surfaces. All space is formally organized.

The art is full of power and tension, reflecting the enormous energy of the environment and its people. Wide-eyed, open-mouthed, and outstretched figures seem poised to leap from totem

The famous "Hole in the Sky" totem pole from the Gitksan village of Kitwankool, in British Columbia. Presently free-standing, this totem pole once adorned the front of a large house. Visitors entered the house by climbing a ladder up to the hole, which served as the house entrance. Remote Kitwankool is one of the few villages where totem poles and other aspects of traditional Northwest Coast life survive in their original locations.

poles and from paintings on the front of houses. Figures intertwine with and transform into one another. The salmon eye, a very popular motif, is actually a representation of a salmon head with its own smaller eye. This motif is often inserted into the pupil of the eye of another larger figure, which in turn may be a component of yet another figure. This constant transformation of figures within figures generates a dynamic sense characteristic of Northwest Coast art.

The fruits of an abundant environment support a dense population requiring complex political and social organization. Political and social power are reflected in the art of Northwest Coast peoples. All life is ranked from the greatest to the least. Every aspect of the creation is assigned its place and knows or keeps it. Great chiefs of noble lineages lead the people. They serve as the patrons of an art that validates their power. Much of Northwest Coast art illustrates the heraldic crests of important families. Most of the masks and costumes produced by Northwest Coast artists are made for dances and ceremonials sponsored and owned by powerful clans and leaders.

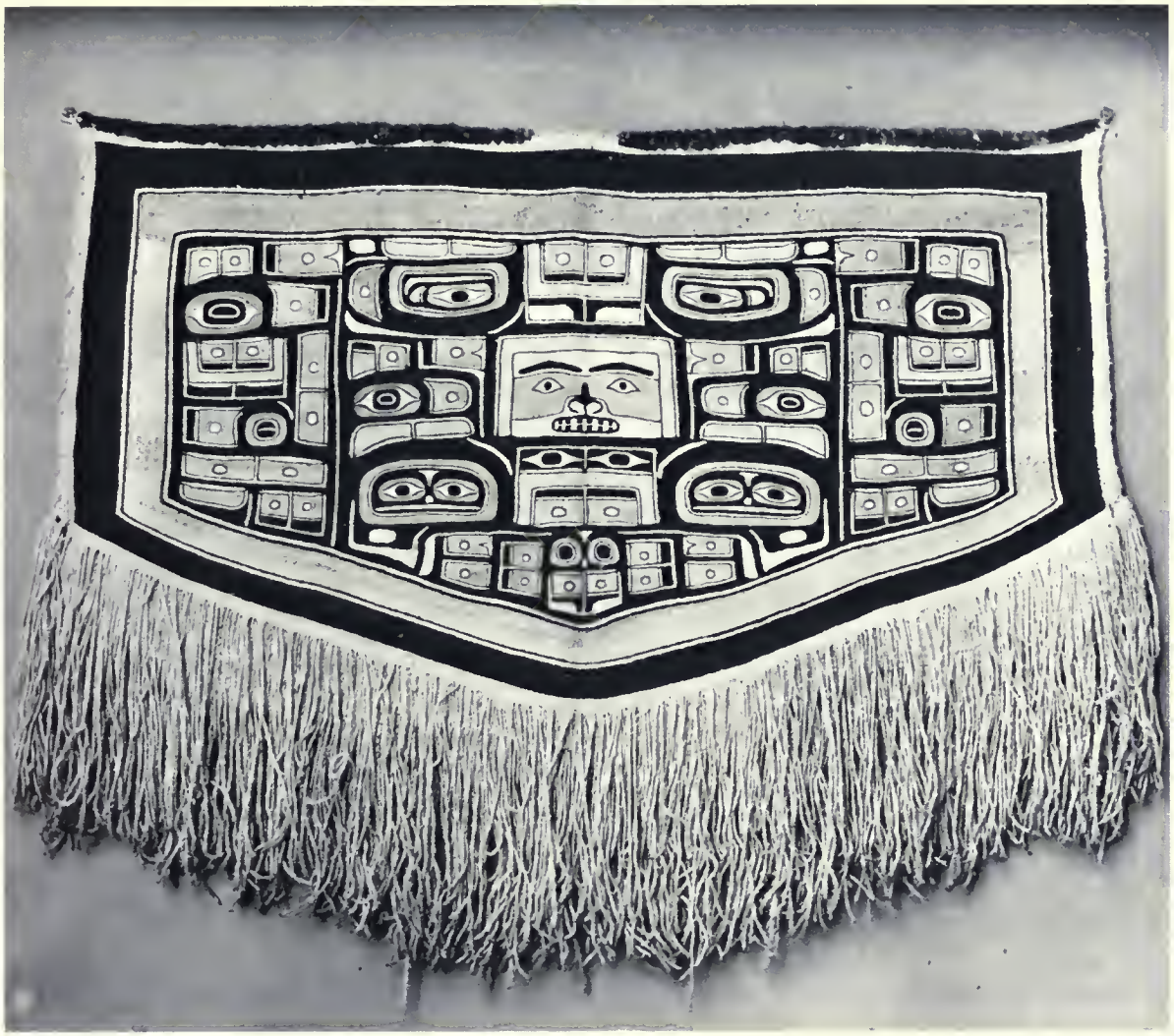
Spiritual power also plays an important part in Northwest Coast art. An abundant land fosters many mysteries. Deep shadows are everywhere—in the depths of clear waters, in the thick forests, in dense banks of fog and rain, between boulders and in cliffsides, and on the towering mountain sides. The noises made by animals, rushing water, and the wind sometimes evoke the howls and screams of mythological creatures such as the hairy female cannibal *tsonoqua* or the wildman *bookwus*. Spirituality suffuses all aspects of life and land. Stone, stem, and flesh are animated by spirit power. Rules governing the depiction of spirit beings are strict. For example, Crooked Beak of Heaven, an important Kwakiutl spirit being, can be represented only by a limited number of forms and colors organized in a specific way.

Richly carved and decorated frontlets are worn by powerful Northwest Coast chiefs. This Tsimshian example collected from the Skeena River is richly inlaid with abalone shell, surrounded by 40 rows of ermine skins, and adorned on the top by sea lion whiskers and red and black feathers. The carving of the beaver is identified by the conventional buck teeth, hand-held sticks, and cross-hatched tail motifs.

Westerners have not always regarded the work of Eskimo and Northwest Coast artists as art. First collected as curios by the earliest European visitors to their shores, the arts of the Arctic and North Pacific Coast soon achieved the status of ethnographic artifacts and as such were avidly collected by museums and private collectors. The intensity of these efforts increased during the first half of the twentieth century. Eskimo and Northwest Coast culture was thought to be in serious and irreversible decline. Museum expeditions combed Eskimo and Indian villages for artifacts to rescue from the missionaries' torch, from the rot and decay of age and abandonment, and from other museums. Interestingly enough, the art of the Eskimo and Northwest Coast Indian took its place among the world's great art traditions during the 1940s, just at the time it was felt that the art and culture of this region had all but died out.

Reports of the demise of Eskimo and Northwest Coast art were premature. Eskimo and Indian artists and ceremonialists quietly carried on their traditions despite missionary and governmental suppression. Suppression changed to support following World War II as a large and growing market for Eskimo and Indian art sprang into existence. New art forms appeared. Eskimo soapstone carvings and wooden sculpture from the Northwest Coast were widely collected. The limited edition silkscreen prints of Indian and Eskimo artists have been in great demand. The Canadian Eskimo have established several cooperatives to produce and market their art. Today we are witnessing an unprecedented renaissance of traditional Eskimo and Northwest Coast culture. This renaissance is more than the mere mimicry. It is rather an encouraging example of the dynamism and resilience of humanity, another instance of people taking from the past to create a lifestyle at once new and within an ancient tradition.

ARTS OF TIDE AND TUNDRA: AN ARCTIC AND NORTHWEST COAST PERSPECTIVE invites you to sur-



Blankets were an important item of wealth. This type, known as a Chilkat blanket, after the Tlingit-speaking Chilkat Indians, is made of mountain goat wool dyed black, white, yellow, blue, and red. Earlier blankets were made of tanned skins.

vey both modern and historic masterworks. Explore the intimate relationship between art and its environment. Learn how objects, form, design, and style mirror the dynamic interactions of rulers and the ruled, of hunters and the hunted, and of the material and spiritual realms. All lectures feature the art and artifacts of the Museum's new permanent exhibition—*Maritime Peoples of the Arctic and Northwest Coast*. From imposing Indian totem poles to delicately carved Eskimo ivory, North America's greatest artistic heritage is explored. The course of study begins April 13, and details are available in the Spring, 1982, *Courses for Adults* brochure.

You are also invited to attend *Tales from the Smokehouse*, a related special event. Presented by the Theatre Sans Fils (the no-strings puppet theatre), giant puppets act out two Canadian Indian legends. A love story and a tale of tribal power are combined with drama and spectacular puppetry to make Ojibwa and Tsimshian lore come alive for non-Indian audiences. Through the stories, you are introduced to social mores, daily routines, and sacred rites quite unfamiliar if not totally unknown to most people. It is a remarkable performance interweaving traditional symbolism and contemporary theatre. *Tales From the Smokehouse* is presented on Saturday and Sunday, June 26 and 27, at 2:00 p.m. Details of the performances are featured in the June *Calendar of Events*, sent to members.□

NEH Learning Museum at Field Museum

The NEH Learning Museum program is a three-year sequence of learning opportunities focused on the Museum's outstanding exhibits and collections and designed to give participants an opportunity to explore a subject in depth. Each unit of study consists of one or more special events, a lecture course, and a seminar for advanced work. Special events are lectures by renowned authorities or interpretive performances and demonstrations. Course members receive an annotated bibliography, a specially developed guide to pertinent Museum exhibits, and study notes for related special events. In-depth, small group seminars allow more direct contact with faculty and with Museum collections.

AYER FILM LECTURES

March and April

JAMES SIMPSON THEATRE

Saturdays, 1:30 pm

The Spring Edward E. Ayer Film Lectures are offered each Saturday in March and April. **Please take special notice of the new, earlier starting time—1:30 pm.** These 90-minute travel films are narrated by the filmmakers themselves, and are recommended for adults. Admission is free at the Museum's barrier-free West Entrance, located on the ground floor. Handicapped persons have access to the theatre via this entrance. Doors open at 12:45 pm for Museum members. When the theatre has reached full seating capacity, the doors will be closed by Security personnel in compliance with fire regulations.

Roger A. Powell

March 6
"Footloose in Newfoundland,"
by Tom Sterling
A visit to Newfoundland brings you the wonders of nature—the great fiords, bird colonies of gannets and kittywakes, whales, moose, and tundra plant life. Sterling also introduces you to the people of Newfoundland—their families, "outports," and daily life.

March 13
"Switzerland," by Ric Dougherty
Visit Chateau-D'Oex, a tiny hamlet of Swiss chalets, ride up Mount Rigi, and trek to the Matterhorn. Watch the Reynaud family making Gruyère cheese, and stay to welcome the celebrants from Vivey of The Feast of the Wine Growers, Europe's greatest folk festival.

March 20
"In the Footsteps of Richard Halliburton," by William Stockdale
From London to Spain, to India and Khyber Pass, we follow in the footsteps of adventurer Halliburton (1900-1939). He climbed the Matterhorn, swam the Hellespont, and sailed a junk out of Hong Kong, never to be heard from again. Join Stockdale as he retraces Halliburton's travels.

March 27
"China After Mao," by Jens Bjerre
This fascinating film invites you to sail down the beautiful Likian River, explore giant caverns, tour Peking, and take a train ride through China to Kwangchow (Canton). Bjerre also explores the many changes in China since the death of Mao —changes which have deeply affected each individual with new freedom.

April 3
"The Galapagos," by John Wilson
A devoted naturalist and cinematographer, Wilson explores the Archipelago of Columbus—better known as the Galapagos. Because these islands are isolated, they are home to some of the world's most remarkably adapted wildlife. Scenes include the courting of the albatross, a climb to the top of Volcan Fernandina, and a trip to Alcedo Crater—home of the Galapagos Tortoise.

April 10
"Paris and the Seine,"
by Kathy Dusek
The film begins in the hills of Burgundy, then on to the medieval city of Troyes. See Paris at sunrise, the flower market, and the Louvre. Visit Rouen and hear the story of Joan of Arc. Finally we arrive at Normandy and Le Havre—totally rebuilt since World War II.

April 17
"South and East Africa,"
by Ted Bumiller
An exciting film safari to the great continent of Africa. Game preserves abound with wildlife—elephants, leopards, and crocodiles. Watch fishermen catch the 200-pound Nile perch; climb Kilimanjaro, visit Nairobi, and meet Africa's many peoples.

April 24
"Himalayan Odyssey,"
by Frank Klicar
The Himalayas are the meeting place for Buddhism, Hinduism, and Islam. Pilgrims seek spiritual enlightenment at Bhaktipur in Nepal, Rishikesh on the Ganges, and at the Tibetan monasteryof Leh. Village activities center on grain planting and harvesting, processing tea, making rugs, raising livestock, and paper-making.

NIHOA ISLAND

An Archaeological Mystery In the Hawaiian Chain

By THOMAS J. RILEY

PHOTOS COURTESY OF THE AUTHOR

Fluffy cirrocumulus clouds were being herded west by gentle trade winds to become part of another magnificent Honolulu sunset as the 40-foot sloop *Ho'o Holo* cleared the Alawai channel. Outside the last channel buoy, our skipper headed her into the wind as we set the main and genoa sails and joined the clouds in their migration into the reddening west. This was the first leg of a small scientific expedition to the island of Nihoa in the northwest part of the Hawaiian chain. If you have never heard of Nihoa, you are not alone. This little island and its neighbor, Necker, some 150 miles north of it, were unknown even to Hawaiians at the time that Captain Cook landed there in 1778. Few of the present-day inhabitants of the state of Hawaii have ever seen either of them.

Two of us aboard the *Ho'o Holo* were scientists. Carl Christensen, a malacologist from the Bernice P. Bishop museum in Honolulu, was interested in collecting land snails from Nihoa,

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Thomas J. Riley is associate professor of anthropology at the University of Illinois at Urbana-Champaign. *He wishes "to thank John Carroll, a man for all seasons, who made the trip to Nihoa possible; Sheila Conant, a dedicated scientist who welcomed a group of intruders to her research area in most gracious fashion; Carl Christensen, malacologist; and the crew of* Ho'o Holo, *Dan, Bill and John, without whom we wouldn't have gotten there and back. A special thanks to Barking Sands Missile Range radiomen and to the U.S. Navy."*

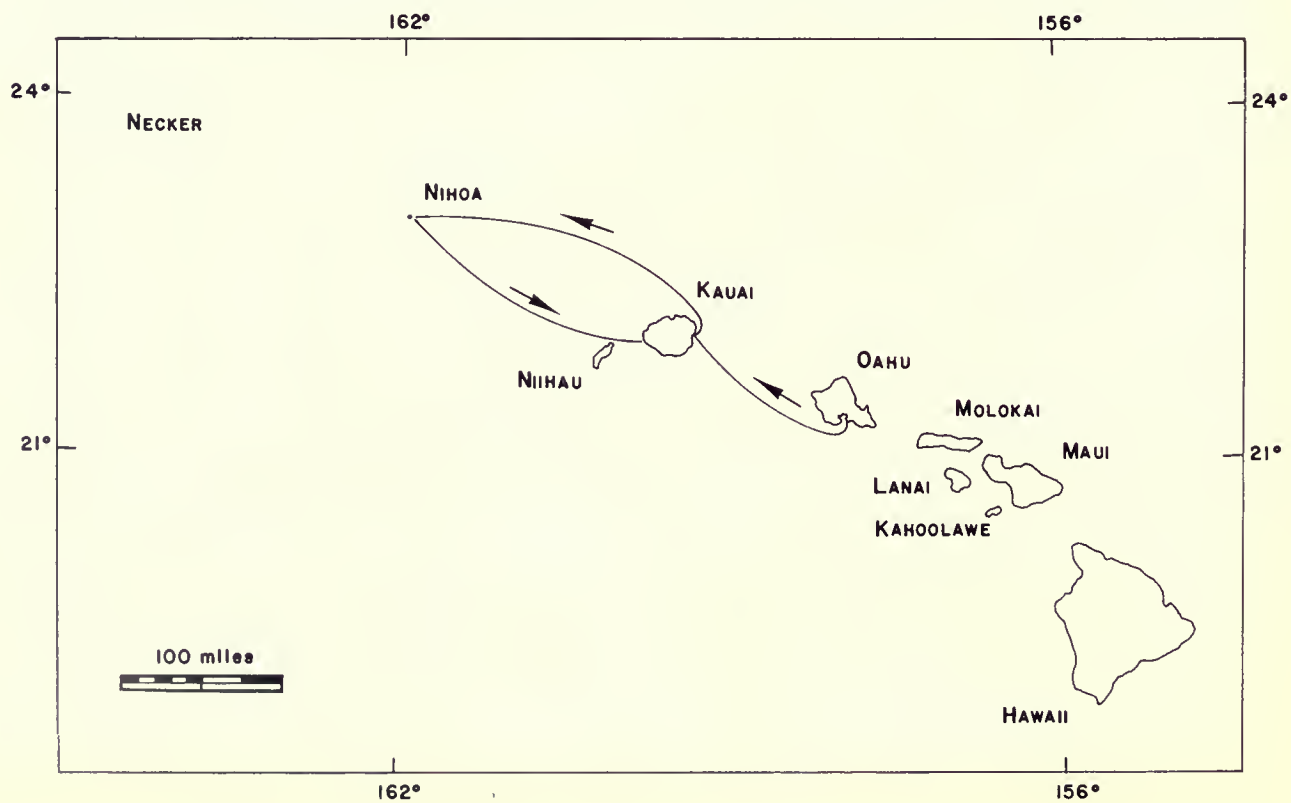
In the first day's trek we found only one artifact, a donut-shaped object of pumice—probably a net float.

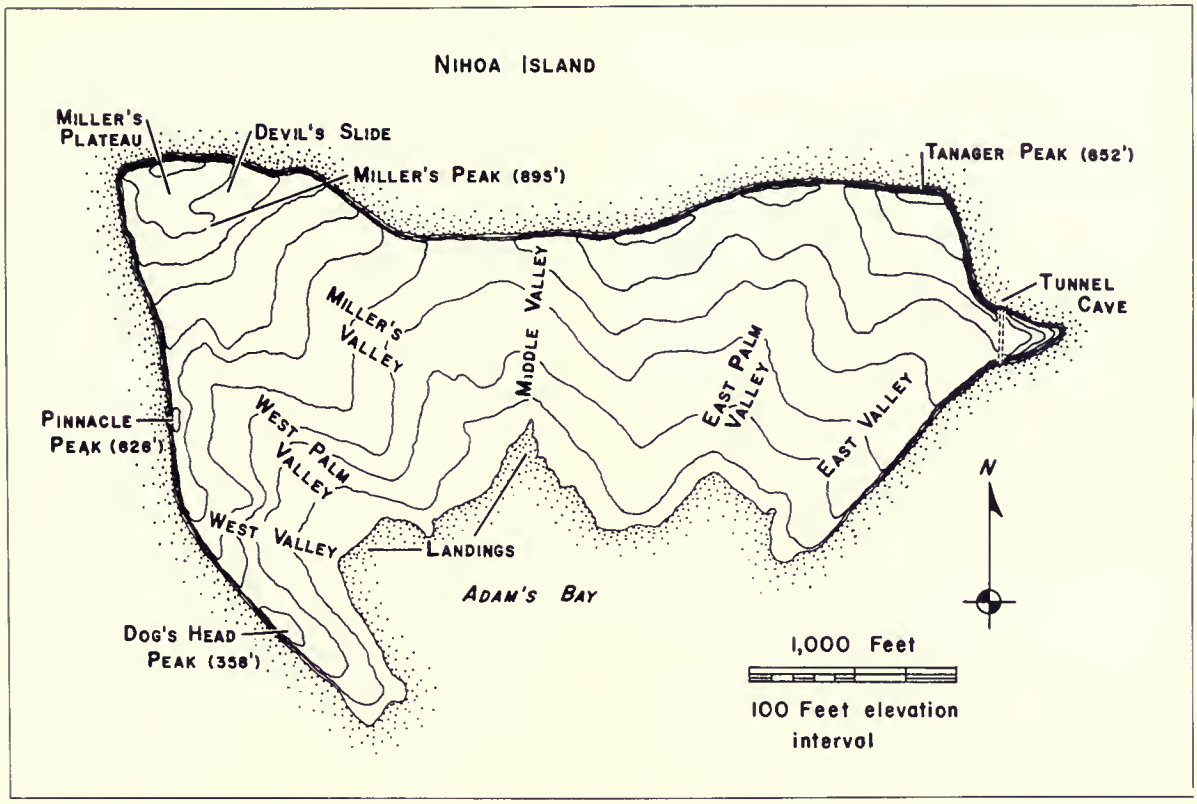
A rectangular stone platform in East Palm Valley, possibly associated with the marae *(temple) just below it.*

and I was interested in the numerous archaeological remains that had been noted there earlier in the century. The expedition was purely one of reconnaissance for me. No archaeological excavations would be undertaken in the scant two days that we planned to spend on the island and all the surface artifacts that I found would have to remain in place, with only maps to tell where they had been found. The major goals of my visit were to describe the condition of the archaeological sites there and to collect some curious material known as volcanic glass that ancient Polynesians living in the Hawaiian Islands had used for making small tools.

The archaeological sites in Nihoa island had been studied once before, by Kenneth Emory of the Bishop Museum, who had spent a short time in 1924 completing a survey and excavations at various sites on the island. A couple of short visits in the 1970s, one by ethnobotanist Douglas Yen, and another brief visit by a National Park Service archaeologist, provide us with the only other information that the archaeological profession has of the sites that are located on Nihoa. My own reconnaissance was geared towards finding out how much destruction had occurred on the various sites on the island so that the U.S. Fish and Wildlife Service could use the information in preparing nominations for the National Register of Historic Places.

A second reason for my visit was to collect fragments of volcanic glass that might be on the surface of some of the sites on the island. Volcanic glass is similar to obsidian in that it is produced by vulcanism, but it differs in the amount of silicon dioxide contained. Like obsidian, though, the flakes produced from this glass provide sharp cutting edges and the ancient Polynesians of Hawaii used them extensively for fine cutting tools. Both obsidian and volcanic glass can be dated by hydration: the depth that water has penetrated and altered the surface from the time that the glass was chipped as a tool. This weathering is fairly regular and can be measured under a microscope. It was my hope that on Nihoa would be some remains of this material that had either been found there or brought from the main Hawaiian group by the inhabitants of the island. In this way it might be





possible to date the length of time that Nihoa was visited by Polynesians and perhaps tie this tiny island into the chronology that archaeologists are now developing for the main Hawaiian Islands.

The expedition was organized with the help of John Carroll, then a Hawaii state senator and member of several committees concerned with Hawaii's fisheries and natural resources. There were plans to open fishing areas in the northern islands and Senator Carroll was interested in discovering the potential impacts of such a political decision.

The sloop (owned by Carroll) made its way slowly down the south coast of Oahu and across the treacherous Kauai channel, so rough that it protected Kauai from conquest by the chiefs of the other Hawaiian Islands during ancient times. Even the great chief Kamehameha I, who conquered all the other islands during the late eighteenth century, was prevented from making war on Kamualii, chief of Kauai, by the monstrous seas here. Our passage was calm and peaceful, however, and we put into Nawiliwili harbor on Kauai to pick up Senator Carroll and our navigator.

At about midnight we departed Kauai, skirting its eastern shore and sailing north and west around Hanalei and Ha'ena. Sailing west, we eventually lost site of Kauai, the last main island of the windward group, and with a following wind made the tiny islet of Nihoa just before dawn the next day.

At the best of times Nihoa presents an eerie prospect to the visitor. It is a small craggy volcanic remnant of some 156 acres (equal to about 36 average city blocks) surrounded by the deep Pacific. Its inhabitants are chiefly the many species of seabirds that abound in the northern Pacific. The quiet of the island, with no signs of human life on it, is interrupted only by their varied calls and the crashing of the waves against its cliffs. There are no protected beaches here and the small size of the island prevents the development of either a calm lee side or a fringing coral reef. The little coral that manages to survive around the island is deep below the surface of the water where it is safe from the massive ocean swells.

We arrived at night, shortly before dawn, and heard the seas breaking along Nihoa's cliffs before we saw the island itself. The only other sounds were the screams of shearwaters night-fishing in *Ho'o Holo's* wake and the occasional slapping of canvas as the swell caused a slight luff in the jib. In the dark we could make out no geographic features and we circled the island for the next hour until a gradual reddening in the east silhouetted the peaks at either end of it.

The two peaks, Miller's on the west and Tanager to the east, bracket six small valleys, hardly more than large gullies really, that make up the bulk of the island. Between the valleys are short ridges of land that are covered with low green growth of native chenopods (the spinach and beet family) and other plants. In

The author standing by prehistoric stone temple terrace with standing slivers of basalt. Trees in background are Pritchardia remota, *a species found only on this island.*

two of the valleys, West Palm and East Palm, are stands of a rare tree, *Pritchardia remota.* This genus of palm is noted elsewhere in the Hawaiian chain, but the species is endemic to Nihoa. It is endangered and even from the sloop we could count every individual tree of that species in the world.

After first light we found an anchorage of sorts on what appeared to be the lee of the island between Miller's Peak and a small crag called Dog's Head. None of us were pleased with the direction of the swell or the possibility that if the sloop dragged anchor she would be pounded against the 800-foot-high cliff that lay less than 70 yards off her stern. The day seemed calm enough, however, and we launched our inflatable raft, filled it with equipment and crew and a crate of oranges, and took it along with the boat's dinghy around to our landing place on Adam's Bay on the south side of the island. The oranges were a special treat for a young ornithologist, Sheila Conant from the University of Hawaii, who was taking a bird census of the island during its major breeding season.

Sheila had been on Nihoa for a month before we arrived, and was instructed by the U.S. Fish and Wildlife Service to make certain that we abided by our research permit. The conditions of the permit included several important caveats. First, no smoking or vegetable materials that could possibly grow on the island could be landed there. To guarantee this, each crew member had to provide new clothes and equipment for the expedition. What if a new plant were introduced to the island? The results could possibly be devastating to the fragile ecological balance that exists on this little rock. A fire started from a careless match could be just as disastrous, and possibly destroy the habitat of two of the endangered species there, the Nihoa Finch and the Millerbird, both of them endemic to this little plot of land, and found nowhere in the world outside the leeward Hawaiian Islands.

Another condition of our work was that we stay well clear of the Hawaiian monk seal if any happened to be around. It was unlikely that this particular endangered species would be there. We did, however run into three of these large animals sunning themselves on the small sand beach just below Middle Valley. These animals, too, are an endangered species, and exist only in the Hawaiian Islands. Their numbers are so few that biologists fear that they won't last out the century.

Our plans were to spend only two days on the island, returning to our boat each night so that we might not interfere either with Sheila's research or with the animal and plant populations that Nihoa rightfully belongs to.

I am an anthropologist first and an archaeologist second, and I thought that I had a fair idea of what intrusion on native populations might imply. In situations where I am dealing with a human community that hosts my work, I attempt to be as circumspect as possible, keeping within the strictures of local custom and mores. I try to determine which parts of the scientific enterprise are possible within the confines of the society with which I am working, and sometimes have to abandon particular areas of research if they conflict with local political problems or with other exigencies of a situation. I have always managed tolerably in human situations, but on Nihoa I felt as if I were treading on eggshells—which in fact I was during my short stay.

Sheila pointed out to us all that the breeding season of Bulwer's petrel was well underway at the time of our visit. This small bird nests in burrows or on the ground. At each step through the low scrub we had to take care not to crush the nests of these animals and condemn birds to a death by suffocation or starvation. Every now and then we would destroy one of their burrows and would have to stop to dig the poor bird out and restore the burrow. Several species of shearwater are ground breeders. In these cases, we had to be certain not to stay for any more than a few minutes in the vicinity of the abandoned eggs after the frightened birds had fled our presence. Any more than a few minutes in the sun and the eggs would have overheated and the chicks died.

If the numbers of birds had been less on Nihoa, the problems that they presented for our progress across the island would have been negligible. We were' however, faced with the prospect of several hundred thousand of the creatures on a small rock of less than a quarter mile in area. However careful we were, all of us had the feeling that we were making an impact on the bird populations purely by our presence there.

Staying close to the trails that Sheila used,

we set out with her assistance to explore the archaeological sites on the east side of the island. It was our intention to relocate each of the sites that had been reported in earlier work there and then to assess as completely as possible the conditions of the sites as compared to the time when they were originally reported by Emory in the 1920s. Crossing from Middle Valley to East Palm Valley we noted long irregular lines of stone walls, clearly field boundaries, that roughly contoured the talus slopes. It was these field boundaries that served to convince Emory that some of the early Polynesian people who settled Nihoa were permanently living there rather than visiting yearly from the island of Kauai, 150 miles to the southwest. An occasional rectangular stone-faced terrace jutting from the slopes marked the foundation of a domestic structure that had been constructed centuries ago. These foundations are all that remain of the works of man on Nihoa at the present time.

In East Palm Valley, however, the number and complexity of stone remains is greater than on the high areas between valleys. Nestled in the center of the valley are a series of high stone-faced terrace structures, exceedingly well built and well preserved. Some were excavated by Emory and his colleagues in the 1920s and yielded stone bowls, adzes of hard basalt, needles of bone, fragments of gourds used as containers, a decayed wooden shuttle used in the manufacture of fish and bird nets, and a single file of the type used in finishing fish hooks. This last was made of coral.

The structures in East Palm Valley included a number that, from the presence of basalt dike slivers that had been placed upright in them, could only be interpreted as temples. Emory recognized that they were quite different from most temples on the main islands of Hawaii, and so designated them *marae,* the Tahitian word for temple, rather than the Hawaiian name *heiau*.

In addition to the standing structures in East Palm Valley, a small cave high in the side of the valley, fronted by a terrace, was either a shrine or dwelling place. A standing stone still guards the entrance to this cave and within it are several grinding stones. The place remains today just as its residents left it hundreds of years ago.

Rockshelter with constructed platform and walls, at east end of Nihoa. Sites such as these served as dwelling places for prehistoric Polynesians during their settlement of the island.

In East valley near the coast are a series of rockshelters with wide terraces in front of them. Some of these shelters have well made stone walls partitioning them. The insides of many shelters have been disturbed, not by man, but by the burrowing activities of some of the birds in nesting. They appear to be favorite places for petrels as well as the red-tailed tropic bird. The activities of these animals have done some damage to the integrity of the archaeological deposits within the rockshelters, and it is possible that stratigraphy in these sites has been upset by bird burrows.

Emory recorded 66 archaeological sites on

the island in his survey in the 1920s. These appeared to him to represent the entire range of Polynesian sites, from domestic structures to agricultural terracing to sacred shrines, and suggested permanent settlement. In a series of deductions he concluded that the 12 acres of agricultural terracing on the island could have produced 48 tons of sweet potatoes, a crop which Emory felt would have been best suited to the area. He suggested that the 25 to 35 foundations for domestic structures and the 15 rockshelters on the island could have supported a population of about 170 to 220 persons, with 5 per house and 3 in each rockshelter. However, the agricultural yield in sweet potatoes would have been far too little (between about 400 and 600 lbs. per person per year) to support such a population. Even if all the house foundations and bluff shelters were not occupied at the same time, the yields would have been a scant diet supplement.

A population of 50 could have had only 1,900 lbs. of sweet potatoes per person during the year, or a little over 5 lbs. per day. While this is an adequate dietary supplement for Polynesian populations, it could hardly have been the staple. For this, we would have to look to the bird population, and potentially a heavy reliance on marine resources as well. There is no doubt that the hundreds of thousands of birds on Nihoa would have been one of the prime resources of the population there, and Polynesians were avid bird hunters and egg gatherers.

There is one serious problem, however, for sustaining a permanent settlement on the island. This is the fact that it has little or no fresh water. Three seep springs were known on the island at the time that Emory completed his survey, and no more have been found since then. These springs are heavily contaminated by bird guano, and the bitter ammonia-water that drips from them appears to be almost unpalatable. It is possible that there are underwater springs issuing directly into the ocean from a submerged dikeline, but so far none have been noted on the island. The inhabitants must have depended on rainfall for their fresh water needs, and prolonged drought may account for the abandonment of the Polynisian occupation there.

All this assumes that the settlement at Nihoa was a permanent one. At the present time we have little evidence that it was either permanent or that there was only one settlement of the island. Emory suggested on the basis of adze types and what appeared to him to be two different types of marae on Nihoa, that the island was actually inhabited twice. The first time by a set of people from its neighbor island, Necker, and later by seasonal bird hunters from the main Hawaiian group, most notably Kauai, the nearest of the large islands of the windward Hawaiian chain. His evidence consisted for the most part of the adzes found at most of the sites. Adzes are extremely diagnostic in Polynesia. The shapes that Polynesians gave to these woodworking tools vary considerably from one island group to another and over time as well. The adzes on Nihoa were almost all similar in form to the styles of adze that developed in the Hawaiian Islands fairly late in time. The few that were different looked very much like the enigmatic adzes from Necker island some 180 miles to the northwest of Nihoa, and fit with Emory's idea of an early stratum of settlement from this small, bleak rock even further removed from the main Hawaiian chain.

The later settlement, however, from the main Hawaiian group, was quite different in character. The lack of water on Nihoa and the proliferation of temple sites all suggested to him that the people who came here stayed only during the birding season, probably during the summer when the petrels, shearwaters, and the other species of bird were most numerous on the island. At the moment, the particulars of the history of the island's settlement are still shrouded in mystery.

I was hoping that an intensive search of the surface of archaeological sites on Nihoa would yield some evidence of volcanic glass. The extensive disturbance of the sites by birds had led me to expect that some of this material, so important in dating many archaeological sites in the Hawaiian Islands, might be gathered from the dirt turned up by these animals' burrowing. If some could be retrieved, then we would have at least the minimal kinds of materials to put this island into the chronological framework that archaeologists have been developing for the main Hawaiian islands.

At the present time the initial settlement of the main Hawaiian islands is thought to have been from the central Pacific, specifically the area that includes the Samoan and Marquesan groups. Radiocarbon dates and volcanic glass agree on a settlement in the A.D. 400 range, with subsequent population growth occurring in Hawaii because the early human populations there had no competition from other predators.

The earliest dates in the main chain are from sites surrounding a coastal swamp on the north side of the island of Oahu and from a little valley called Halawa on the east end of the island of Molokai. There is little doubt that the whole Hawaiian chain, however, was populated by the ninth century A.D. and some of my own work at Ha'ena on Kauai has shown a well de-

veloped population there by the twelfth century A.D. If we could recover some of the volcanic glass from the sites of Nihoa it would not only be possible to date the settlement, but it might also be possible to identify the source of the volcanic glass on the island of Kauai. Unfortunately, in the first day's trek, when my assistant and myself were recording the damage to archaeological sites and carefully searching their surfaces, we found no signs of volcanic glass, and only one artifact.

The artifact was a single donut-shaped object of pumice, a porous volcanic substance that floats. It was located in the rubble from a fallen corner of the most complete Marae of East Palm Valley, the site that Emory had called number 50. The artifact was probably a net float.

As we made our way back to the landing place in the late afternoon, we travelled the high trail of the island close to the cliff edges. It was a sheer drop of 600 to 800 feet to the sea below, and up there the moaning sounds of the shearwaters drowned out the sounds of the crashing waves. Both of us were disappointed, but we were certain that we would have better luck as we recorded the sites on the west end of the island the next day.

We left Sheila on the island, and I left my equipment and rucksack as well, though I took my hastily sketched notes and camera with me back to *Ho'o Holo*. That night we shared experiences, since Christensen, along with John Carroll, had collected terrestrial snails on the west end of the island as my assistant and myself trekked the east valleys. Christensen was excited to have collected several species of which very few examples existed, and I was excited by the fact that comparatively little disturbance had occurred to the archaeological sites. The preservation was still comparatively good. Certain that the next day would bring better fortune in terms of recovering datable material, we all turned in.

The "certainty" was an illusion. During the night we felt *Ho'o Holo* shift at her anchorage as the wind veered to the southeast, and then at about four in the morning we heard a loud crashing sound towards the stern and the boat shuddered from sternsheets right through to stem. We all turned to and immediately prepared to make way. A check of the bilge showed that *Ho'o Holo* had not been holed, but the stiffening southeasterly wind and the rising swell made it necessary to leave our anchorage and run ofs the island. At dawn we could see the massive breakers battering themselves to spume on the cliffs that were the only landing place on the island. It was obvious that our second day of reconnaissance on the island would have to be abandoned. After radioing Sheila, we set sail for Kauai in what became a heavy sea and wind. Two days later, with a heavy sea still running and the winds still blowing out of the southeast, we made Port Allen on the south end of Kauai.

The weather around Nihoa is traditionally fickle, and our problem of having to abandon our second day on the island was only repeating what other parties had experienced before. In the 1820s the commander of the *U.S.S. Dolphin* , Captain "Mad Jack" Percival, had landed on the island only to be trapped there with his boat's crew for two and a half days. His boat was smashed by waves on the island, and finally he was dragged from the shore by a line brought in to him by a sailor who braved the massive seas.

The recommendations that I made to the Fish and Wildlife Service included the fact that preservation of archaeological sites on the island was quite good. The little destruction that had occurred since Emory's visit consisted mostly of natural erosion and the nesting efforts of the birds. I remain disappointed that no material suitable for dating was recovered from Nihoa, but any archaeological research that takes place on this island will have to be scheduled during a time of the year when there will be minimal damage to the wildlife that inhabit the place. This would mean the winter months, when the seas are notoriously bad. It was in January that "Mad Jack" and his boat crew were stranded there. The risk of landing at this time of year and of not being able to get off the island when the work was finished, make the archaeological endeavor here a dangerous one.

Despite our own attempts, and those of earlier researchers in Pacific archaeology, Nihoa still holds to the secrets of its past. Where did the residents of Nihoa come from? Were they pilgrims from Kauai who built temples during the birding season each year? Was there an earlier settlement connected with the little rock called Necker that is even more remote in the Hawaiian chain? How long ago did Polynesian settlement begin and when in prehistory did it disappear? The answers are still locked up on the silent stone remains of Nihoa, guarded over by myriads of Pacific seabirds, and as yet unsolved by modern archaeology.

As a final note, we discovered that the crash that awoke us that night at anchor was not due to the boat striking either rock or coral. Senator Carroll informed me that when *Ho'o Holo* was brought up on the ways for cleaning in the winter of 1981 he discovered tooth marks from a large shark on the rudder post. This marine predator had apparently attacked the boat that night, inadvertently alerting us to the changing wind and water conditions. □

For Our Volunteers: A Special Valentine

1981 was yet another year of outstanding, dedicated performance by Field Museum's battalion of Volunteers—280 strong. Collectively, they contributed 42,756 hours of selfless commitment — in virtually every facet of Museum activity: collection maintenance, specimen preparation, library work, photography, typing and other clerical tasks, phone answering, editing, even assisting in scientific research and conducting educational programs; and the list goes on. Their contributions of time, talent, energy, and enthusiasm have become essential to the functioning of the Museum.

To honor these volunteers a reception was held on the evening of February 17 in Stanley Field Hall. The Museum's president, Willard L. Boyd, offered a special welcome and words of appreciation to the evening's guests, and Museum Director Lorin I. Nevling, Jr. presented awards to those two Volunteers with fifteen years of continuous service to the Museum: Dorothy Karall, who works in Zoology, Division of Invertebrates; and Ellen Hyndman, volunteer instructor in the Museum's Department of Education.

Dorothy Karall was recommended to Dr. Alan Solem in 1966 by his illustrator, the late Margaret Anne Moran McKibben. Having been told that Dorothy was an ex-Marine, Solem was hardly prepared to meet the diminutive lady with a beguiling South Carolina accent. With her innate sense of order and art training, Dorothy has, in the intervening years, mounted and labelled plates and figures for more than 50 of Dr. Solem's scientific papers. Week after week she walks into the Invertebrate office with her cup of coffee and settles down to the task of trimming and mounting scanning electron microscope photographs or taking highly complex anatomical drawings and putting the explanatory lettering on them, later mounting these for publication in technical articles. In 1977 Dorothy was appointed associate in Invertebrates.

Ellen Hyndman also joined the Museum as a volunteer in 1966, welcoming this opportunity to "do something for herself." At that time the Tibetan exhibit was in its preparation stage and Christine Danziger, the preparator, found Ellen's assistance invaluable. Ellen researched and labelled, sewed and mounted specimens. After the exhibit opened, Ellen turned her talents to the Education Department, becoming one of the first volunteers to serve as instructor for school programs. Ellen has given, and continues to give, programs on animals, prehistoric life, American Indians, cultures of Africa, China, and ancient Egypt. She has worked on many of the special exhibits and currently serves as liaison between the Women's Board and the Museum's volunteer program.

Dr. Nevling also gave special recognition to the 14 volunteers who contributed 500 hours or more in 1981 and personally presented them with gifts in appreciation for their commitment. Volunteer Coordinator Joyce Matuszewich concluded the evening's program with remarks on the impact volunteer work has had on the Museum's research, education, and exhibition programs. The remaining volunteers then received their gifts.

Special Recognition

Over 500 Hours

Lorna Gonzales (1,003 hours); Zoology, Insects Division: recorded locality data for taxonomic and biogeographic study; checked localities on maps; entered computer data. Education: conducted English and Spanish programs on geology and anthropology for school groups.

Llois Stein (875 hours); Anthropology: researched and catalogued Pacific and Asian collections; assisted in Pacific storeroom reorganization.

Robbie Webber (720 hours); Anthropology: bibliographic searches and research on recent geology, geomorphology and tectonics of Peru; catalogued Amazonian artifacts.

James Swartchild (697 hours); Anthropology: photographed specimens.

Frank Greene, Jr. (661 hours); Geology: collected Mazon Creek specimens, recorded field distributions; cleaned specimens.

Connie Crane (648 hours); Anthropology: did research, editing, filing and record keeping for Maritime Peoples of the Arctic and Northwest Coast exhibit.

David Weiss (645 hours); Anthropology: Adminstrative assistant in the Asian Division; responsible for overseeing loans; miscellaneous correspondence, special projects.

Rosanne Miezio (637 hours); Zoology, Mammals Division: scientific illustration; assisted with maps and graphs; aided in design and implementation of public exhibit on scientific illustration.

Sol Century (593 hours); Anthropology: accessioned and catalogued in general projects in Asian Division.

Gary Ossewaarde (590 hours); Education: conducted, researched Weekend Discovery tours in anthropology and geology; assisted in special events and children's workshops.

Jim Currey (564 hours); Zoology, Mammals Division: skinned, fleshed and prepared skeletal specimens; regasketed cases; record keeping.

James Burd (560 hours); Anthropology: accessioned and catalogued in general departmental projects in Asian Division.

Margaret Martling (543 hours); Botany: processed picture lists, organized Botany library, proofread papers, record keeping.

Carol Landow (525 hours); Education: instructed school groups and Museum visitors in Place for Wonder.

Over 400 hours

William Bentley (484 hours); Anthropology: photographed artifacts in Asian collections.

Anne Leonard (455 hours); Anthropology: worked on records and photography file for tapa collections and for Patterns of Paradise travelling exhibit.

Carolyn Moore (441 hours); Anthropology: special projects researcher in Asian Division.

Louva Calhoun (439 hours); Anthropology: catalogued Acheulian artifacts from prehistoric site in Tanzania; numbered, measured, and made drawings of the specimens.

Over 300 Hours

Peter Gayford (385 hours); Anthropology: curatorial assistant for Egyptian tomb project; researched in preparation for cataloguing McCormick collection.

Dorothy Oliver (361 hours); Library: indexed Museum's annual reports; assisted with interlibrary loan requests, filed new book cards; special projects.

Lorain Stephens (358 hours); Zoology, Birds Division: prepared a gazeteer of bird-collecting localities in Peru; started preparation of a gazeteer of bird-collecting localities in the Guianas.

Robert Rosberg (353 hours); Anthropology: catalogued collections; pottery restorations; special projects.

Nathalie Alberts (349 hours); Anthropology: moved artifacts into and out of storage for Maritime Peoples of the Arctic and Northwest Coast exhibit.

Alice Wei (325 hours); Anthropology: research in Asian collections.

Julie Braun (320 hours); Anthropology: cleaned artifacts for Maritime Peoples of the Arctic and Northwest Coast exhibit.

Sophie Ann Brunner (317 hours); Zoology, Reptiles Division: organized and maintained skeleton preparation program.

Louise Neuert (314 hours); Anthropology: constructed special mannequins; cleaned and sewed textiles to mounts; dressed mannequins for Maritime Peoples of the Arctic and Northwest Coast exhibit.

Ernest Newton (314 hours); Anthropology: research in Chinese coin collection.

James Skorcz (307 hours); Library; worked in Reading Room; filled interlibrary loan requests, filed cards in card catalog, retrieved books for visitors; compiled statistics; special projects.

Cheryl Williams (306 hours); Geology: catalogued and reorganized Quaternary collections of fossil invertebrates.

Dennis Bara (303 hours); Membership: weekend membership representive.

Eric Frazer (303 hours); Anthropology: worked on preventive conservation and storage of textile collections.

Halina Goldsmith (302 hours); Education: conducted programs for school groups and visitors in Place for Wonder.

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Chicago Bridge & Iron Fdn.
Chicago Title & Trust Co.
Chicago Tribune Fdn.
Clark Fdn.
Crane Packing Co.
Crum & Forster Fdn.
Helene Curtis Industries Inc.
Dana Corporation Fdn.
R.R. Donnelley & Sons Co.
Ehlco Fdn. (Hines Lumber)
Ernst & Whinney
FRC Investment Corp.
GATX Corp.
General Motors Corp.
General Tire Foundation Inc.
Geraldi-Norton Memorial Corp.
Goodyear Tire and Rubber Co.
Gould Fdn.
Guarantee Trust Life Insurance Co.
HBB Fdn.
Hart, Schaffner & Marx Charitable Fund
Walter E. Heller & Co.
Illinois Tool Works Fdn.
Interlake Fdn.
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OUR ENVIRONMENT

Rare Black-Footed Ferret Found in Wyoming

A rare black-footed ferret, the only positively known living member of its species, was captured alive in Wyoming last fall and outfitted with a tiny radio transmitter so that federal wildlife biologists can learn more about the habits of these secretive, nocturnal animals.

The ferret, captured October 29 by wildlife biologists of the Interior Department's U.S. Fish and Wildlife Service, is the first live black-footed ferret to be taken in the wild since 1973, in spite of extensive searches by federal and state biologists in a number of western states.

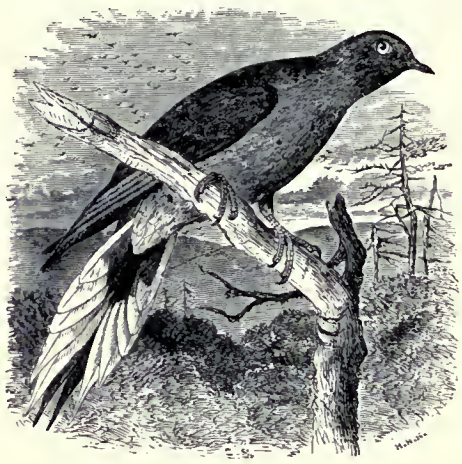
"We are quite excited about finding this extremely rare, endangered mammal and having the opportunity to monitor its movements," said Eugene Hester, deputy director of the U.S. Fish and Wildlife Service. "By studying this animal, we hope to obtain information that will help wildlife biologists bring this species back to healthy numbers."

The ferret, a male judged to be no more than two years old and weighing about two and one-quarter pounds, was spotted in a prairie dog colony by wildlife biologists who were looking for ferrets. They followed it to a hole where they succeeded in capturing it in a live-trap when it emerged several hours later. The biologists attached a small radio-transmitter to a collar placed around the ferret's neck, observed the animal overnight, and released it unharmed in the morning. The transmitter is expected to operate for four to six months, enabling biologists to gather information about such factors as the ferret's daily and seasonal activity patterns, the amount of time it spends in burrows, its feeding activity, and whether it is nomadic. It is also hoped that the radio-tagged ferret may lead the biologists to other ferrets.

The exact location of the ferret's capture is being withheld to avoid disturbance to the landowners and to the scientific work. All of the work involving the ferret is being conducted under a federal permit, which is required because the ferret is protected under the Endangered Species Act.

Considered by many wildlife biologists to be the most severely endangered mammal in the United States, the black-footed ferret is a weasel-like animal about 24 inches long with a black mask over its eyes, black feet, and a black-tipped tail.

In an attempt to increase the ferret's numbers, several ferrets were taken out of the wild between 1971 and 1973 for breeding in captivity at the service's Patuxent Wildlife Research Center in Laurel, Maryland. Although young ferrets were born, none survived, and the adults were found to have serious disease problems such as cancerous tumors and diabetes. The last captive ferret died in 1978.



In the meantime, efforts by federal and state wildlife biologists using scent-trained dogs and other methods had failed to positively locate any additional live black-footed ferrets in the wild. The first real break in the ferret search came September 25, when a dead black-footed ferret was discovered in Wyoming.

Whooping Crane Update

Four whooping crane chicks were raised in wild and captive flocks in 1981, a year which may have suffered a slight population decline despite intensive research to propagate the endangered species.

The highlight of 1981 research was a first-time effort by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service to radio track the main flock on their 2,600-mile fall migration from Canada's Wood Buffalo National Park to the Texas Gulf Coast. On October 12, trackers reported one of the chicks hit a power line in northern Saskatchewan and died several days later of apparent spinal injuries.

While researchers expressed regret over the loss of the young crane, they emphasized that had the flock not been tracked, the fate of the bird would probably have remained a mystery. Service scientists stress that the more they learn about mortalities, the better prepared they are to prevent them. Previous collisions with power lines have been documented in the Grays Lake National Wildlife Refuge flock. Power companies in problem areas have cooperated with researchers to solve the problem, sometimes by attaching brightly colored markers to the lines.

The Wood Buffalo flock produced three chicks in 1981 during an exceptionally dry nesting season that saw increased egg losses to predatory animals. In August, brush fires swept through the forests and marshes, eventually destroying some 70 percent of the cranes' nesting habitat. However, the chicks escaped the ravaged area with their parents and the rest of the flock.

All three chicks in the Wood Buffalo flock were captured and fitted with radio transmitters by U.S.-Canadian researchers several weeks before fire ignited the habitat. Trackers followed the first two chicks to leave Wood Buffalo; the first was being tracked by a team of U.S. and Canadian government biologists in a Canadian airplane when it hit the power line. In southern Saskatchewan an American plane carrying a Canadian biologist—the only tracker to follow the entire route—was standing by to pick up the trail, with a ground research team also following the flock. The same tracking procedures now are being used to track the second chick, last reported to be near Texas. Earlier, trackers found that the tagged chick had covered 470 miles in one day at altitudes of up to 9,000 feet, leaving Montana, overflying North and South Dakota, and landing in Nebraska.

As the international team began monitoring the main flock, other researchers recaptured a captive-reared female whooper set free last spring at Grays Lake National Wildlife Refuge in Idaho. The female had been transported to Idaho from the Patuxent Wildlife Research Center near Washington, D.C., as a possible mate for a lone male raised by sandhill crane surrogate parents. However, scientists felt the two whoopers did not establish a strong enough bond to guarantee that the male would lead the female on the 870-mile migration route to Bosque del Apache National Wildlife Refuge in New Mexico.

The Grays Lake foster flock was started in 1975 to establish a second wild flock of whooping cranes, to build the birds' population, and to eventually ensure separate migratory flocks. This would diminish the chance of a natural disaster eradicating the species in the wild. The sandhill cranes in Idaho hatch

"spare" eggs taken from nests at Wood Buffalo and from a captive breeding flock at Patuxent. A recent shortage of suitable female whoopers prompted scientists to introduce the female raised at Patuxent into the foster flock. Since the recaptured Patuxent female made a good adjustment to the wild, researchers will repeat the experiment next year.

Despite the two surviving chicks raised at Wood Buffalo Park and one raised in captivity at Patuxent, scientists say the whooping crane population has not increased, as several mortalities are known. But the bird that has become a symbol of all endangered species has actually been making a gradual comeback: In 1980, whoopers numbered nearly 100 in the wild and 24 in captivity, in contrast to a dismal low of 15 in 1941, when many considered the cranes' extinction to be inevitable.

Tecopa Pupfish Declared Extinct —Off Endangered List

The Tecopa pupfish has become the first species to be removed from the endangered list because it is extinct. The U.S. Fish and Wildlife Service made the announcement after no Tecopa pupfish were found in spite of extensive searches by federal, state and university biologists in more than 40 localities near Tecopa, California, where the fish could possibly have existed.

The unique desert fish, native to California's Death Valley system, was known to have lived in only two outflow springs of the Amaragosa River system. It is thought to have disappeared because of alteration of its habitat and possibly also as a result of the introduction of competing, non-native fish. One of 12 kinds of pupfishes in the U.S., the 1½-inch Tecopa could tolerate highly saline waters and temperatures up to 110°. In 1965, the two hot spring outflows were rechanneled and combined during construction of bathhouses, resulting in a swifter channel which carried even hotter water farther downstream, a situation for which the pupfish was not adapted.

Virtually eliminated by 1969, the Tecopa pupfish was added to the endangered species list in 1970. By 1972, it was known to be gone from this locality, although survival of the related Amaragosa River pupfish in nearby pools and springs indicated that the Tecopa might continue to exist elsewhere in the river system.

In 1978, the Fish and Wildlife Service proposed the Tecopa pupfish for removal from the list because it was believed to be extinct; removal has been delayed until additional surveys could be completed.

"It is always sad when a species becomes extinct because of human activities," noted Robert A. Jantzen, director of the Fish and Wildlife Service. "But the Tecopa pupfish was possibly already extinct when the first recovery efforts were made under the endangered species laws. In this instance, the fact that this fish has become extinct should not be taken to mean that endangered species conservation measures have failed. On the contrary, recovery actions have benefited a great number of endangered species, such as the American alligator, peregrine falcon, whooping crane, and brown pelican."

Hazardous Waste Disposal and the "Small" Producers

In its 1980 Resource Conservation and Recovery Act regulations, the Environmental Protection Agency announced that generators of less than 1,000 kilograms (kg) a month of hazardous wastes, including certain discarded commercial chemical products, who do not accumulate more than 1,000 kg on site at one time, could be excluded from rules that apply to larger generators of these wastes. Among the discarded chemical products listed are formaldehyde, wood alcohol, benzene, and several other components of plastics.

The exclusion of these smaller generators created controversy. At issue are wastes considered hazardous, excluded from rules that strictly regulate generation, transport, storage, and disposal of such materials. Critics have pointed out that hazardous wastes are no less hazardous because they exist in smaller quantities.

EPA's decision to exclude small manufacturers or processors from initial regulatory framework was based on its belief that the overall level of environmental protection would be greater if it concentrated its resources on larger generators. The agency also considered resources of the states, which are to play an increasing role in implementing RCRA.

To regulate all generators of hazardous waste would bring 760,000 people into the regulatory system. By setting the exclusion limit for most hazardous wastes at 1,000 kg a month, 99 percent of the total wastes would still be covered — and 695,000 people could be kept out of the system.

Generators of even small amounts of hazardous waste still must ensure that their wastes go to state-approved facilities and that wastes be disposed of properly.

In addition, RCRA provides that certain commercial chemicals, considered to be acutely hazardous, are subject to much *lower* exclusion limits if they are to be discarded. That is, certain substances including a large number of pesticides, must be fully regulated if a generator produces and processes as little as 1 kilogram a month of the waste.

Fiberglass Carapace for Mud Turtle

A 13-inch-long mud turtle, its shell collapsed in eight pieces after being hit twice by cars, was rushed to a Florida animal hospital to be put out of its misery.

Instead, the veterinarian built a new shell with the help of an auto body shop, and the turtle recovered.

"There was so much damage I didn't know if we could fix it. But I figured we'd try," veterinarian Mary Leisner said. "Basically, he was a very healthy turtle. What looked bad was the shell. The whole top was caved in like a crater. But the body wasn't damaged.

"The turtle was good through all of this," she said. "We stabilized him and medically treated him, and he didn't seem to mind. The only thing he didn't like was when we vacuumed him to get the slivers and chips out. He put his feet out and tried to run away."

The unorthodox treatment was attempted after Jean Nygren, a director of Tampa's Animal Protection League, arrived at the Lutz Animal Hospital with the turtle. She had seen another car hit it, and then struck it with her own car.

"It was bleeding so badly and the shell was a mess. I thought it didn't have a chance and wanted to see it put to sleep humanely," she recalled.

Leisner examined the turtle with a household drill and delicate bone instruments, lifting depressed pieces of the rock-hard shell. She found nearly half of it had been destroyed.

The veterinarian filed and fit the edges and, with some fiberglass and directions from an auto body shop operator whose wife works at the animal clinic, built a new shell. A dangling three-inch tail section was reattached with superstrength glue.

After a trip to the body shop, where the rough fiberglass was sanded smooth, the reptile, estimated to be about 12 years old, was cared for at the animal hospital for five days. It was then given a clean bill of health and released into a swampy preserve.

William R. Eastman/Tom Stack & Associates

OUR ENVIRONMENT

Homes Needed for Excess Wild Horses and Burros

The Bureau of Land Management (BLM), an agency of the U.S. Department of the Interior, is looking for people who would like to give a wild horse or burro a good home. Qualified applicants can adopt a wild horse or burro for less than it costs to buy one commercially. The horses can be trained to work, ride or to be pets.

These are no ordinary horses and burros. These are living symbols of the history and the pioneer spirit of America's West. Some are descendants of animals that escaped Indian attacks on wagon trains, cavalry attacks on Indians, or Indian-cavalry battles. Others are descendants of stock released by the cavalry when U.S. Army outposts were closed, of animals abandoned or lost by early prospectors, and of horses and burros turned loose by farmers during the Dust Bowl conditions of the 1930s. Some are possibly descended from mustangs introduced by Spanish conquistadors in the 16th century.

"The wild horse and burro adoption program," says BLM Director Robert L. Burford, "is a partial solution to the problem of overpopulation among wild horse and burro herds on western public rangelands. These herds have expanded in most areas since approval of the Wild Free-Roaming Horse and Burro Act in 1971. They compete for very limited forage and water with both native wildlife and domestic livestock that graze the public rangelands. In order to maintain a proper ecological balance BLM rounds up excess wild horses and burros and makes them available for adoption."

Burford adds that approximately 32,000 wild horses and burros have been adopted since the national Adopt-A-Horse Program began in 1976. Adopted horses and burros are now found in every state except Hawaii and Delaware.

What sort of people adopt wild horses and burros? Just about anyone with an interest and affection for the animals, Burford says. "Most of our adopters want to see wild horses and burros protected, not just as a reminder of our nation's western heritage, but as animals worth owning and enjoying."

BLM screens potential adopters for proper facilities and experience to care for the animals, which are unbroken when adopters pick them up. For the first 12 months following adoption, wild horses and burros remain the property of the U.S. government. Adopters may apply for title after providing proper care and treatment for that period.

Since 1979, BLM has operated a wild horse and burro distribution center in Cross Plains, Tennessee—about 30 miles north of Nashville. "The Tennessee center has been a huge success," Burford says, "primarily by making it easier than ever before for people in the states east of the Mississippi River to pick up adopted animals."

"Based on that success—nearly 3,000 adoptions in two years—BLM opened a midwestern distribution center last summer near Omaha, Nebraska, and plans to open another eastern distribution center next April. We've chosen the Harrisburg, Pennsylvania, area for the next center primarily for its proximity to so many potential adopters in the Northeast and its accessibility via the interstate highway system."

Members of the public who would like more information about the adoption program should write to Adopt-A-Horse, Dept. 618-K, Consumer Information Center, Pueblo, Colorado 81009. Along with a brochure on the adoption program, the writer receives an application form to be completed and returned to the Bureau of Land Management. The applicant is asked to specify on the form the age and sex of the horse or burro desired, and to describe the kind of facilities available for the animal's care. An individual can apply for up to four animals a year.

Once BLM approves an application, the name of the potential adopter is placed on a register. As horses and burros become available, the approved applicant is notified where and when to select and pick up the animal. How long an applicant has to wait for an animal after application has been accepted depends upon the number of animals available and the number of prior applicants who want the same sex, color, or age animal. The most requested animals are three-to-five-year-old mares and jennies (female burros).

Currently, there is no charge for these wild horses and burros. An adopter pays only a veterinarian's fee, the cost of transporting the animal from the state in which it was captured to the distribution pickup point, and a portion of the adoption center's handling charge. Since January 2, 1982, there is a fee of $200 per horse and $75 per burro, plus transportation costs. The veterinary cost is included in the adoption fee.

Burford explained that the adoption fee is necessary to help partially reimburse the U.S. Government for what it spends to remove the animals from the rangelands, process adoption applications, provide medical examinations and vaccinations, and feed and handle the wild horses and burros during the adoption process. Adopters are advised of the exact costs when animals become available.

BLM estimates there are currently over 70,000 wild horses and burros on public rangelands in 10 western states, with more than half concentrated in Nevada and Wyoming. According to BLM range specialists, the optimum number the ranges will support for good management is approximately 25,000.

Wildlife Successes in 1981

A happy ending for a "widowed" bald eagle, a promising beginning for young sea turtles, and a successful journey for some endangered geese are just a few of the "good news" stories that happened to fish and wildlife in 1981, according to the Interior Deparment's U.S. Fish and Wildlife Service.

A rare black-footed ferret, the nation's most endangered mammal, was discovered in Wyoming, and service researchers studying it have since observed two more ferrets in the same vicinity. The ferrets are the first to be positively located in the wild since the early 1970s. (See p. 32.)

A female bald eagle in New York whose mate was shot last year got a new family, with some help from wildlife biologists. First she found a new mate—a male eagle that had been transplanted from Minnesota and released at Montezuma National Wildlife Refuge in 1977. Then, because the female was too contaminated with pesticide residues to produce her own young, wildlife biologists put two eagle chicks into the new pair's nest. The chicks were reared successfully and will help to increase bald eagle numbers in New York State.

For the first time ever, two injured manatees were successfully released to the wild in Florida after being rehabilitated in captivity. One of the large, docile "sea cows" was injured when she became entangled in a crab trap line, which wrapped tightly around her flippers. She was treated at Sea World and released with her calf, which was uninjured but had remained with its mother throughout the ordeal. Another female manatee that apparently had been struck by a boat was rehabilitated by two other private groups, Marineland and Homosassa Springs. The oceanaria and park groups rescue injured manatees, an endangered species, under an arrangement with the Fish and Wildlife Service.

On the Hawaiian island of Kauai, a wildlife biologist turned air traffic controller in a research experiment to prevent young night-flying seabirds from crashing into brightly lighted areas. By putting shields on outdoor lights that were confusing the birds—a threatened species called the Newell's Manx shearwater—he succeeded in reducing the number of crashes by 28 percent. And at aid stations established to collect downed birds, members of the public turned in hundreds of the shearwaters, most of which were saved and released to fly another day.

About 2,000 endangered Kemp's Ridley sea turtle eggs were moved by the Fish and Wildlife Service and the Mexican Fisheries Department from a Mexican nesting beach to Padre Island National Seashore, where biologists are trying to establish a second, protected nesting beach. So that the little turtles would become "imprinted" on Padre Island, they were allowed to hatch and make their way to the ocean before they were captured again and transported to a National Marine Fisheries Service facility in Galveston, Texas. They will be raised in captivity until they are about one year old, when they will be large enough to have a good chance of surviving in the wild. The sea turtles will then be released in Gulf waters, and it is hoped they will return eventually to Padre Island to nest.

Scores of endangered Aleutian Canada geese that were raised in captivity in the lower 48 states were transplanted to Alaska's Aleutian Islands and are now migrating successfully with wild birds to wintering grounds in California. In all, more than 2,600 Aleutian Canada geese have been counted on their wintering grounds, up from a low of 800 in 1975.

A record 530 Atlantic salmon returned to the Connecticut River to spawn. The young from the 1.2 million eggs produced by these highly prized game fish will be reared at state and federal fish hatcheries and released into the river to help rebuild the fishery. Salmon disappeared from the Connecticut 100 years ago after dams blocked the migration of adult salmon to their spawning areas. The effort to restore the salmon in the Northeastern United States began in 1967 and involves the Fish and Wildlife Service, the states of Connecticut, Massachusetts, New Hampshire, and Vermont, the Commerce Department's National Marine Fisheries Service, and two private power companies.

As a result of recovery efforts for the severely endangered Puerto Rican parrot, a record number of nine parrot chicks were produced and survived in the wild this year. Two more chicks were produced in captivity, one of which was placed in a nest and survived to join the wild flock. This brings the total number of Puerto Rican parrots to 29 in the wild and 15 in captivity.

Service research biologists reported that eggshell thickness and reproduction are improving in eagles, osprey, and brown pelicans, and that the numbers of sharp-shinned hawks and Cooper's hawks are increasing dramatically. Researchers now agree that DDE, a persistent breakdown product of DDT, was responsible for eggshell thinning, reproductive failure, and population declines in the bird populations.

American shad spawned naturally in the Susquehanna River for the first time in 150 years. The spawning followed the release of 1,165 adult shad in the river in May 1981 by the Pennsylvania Fish Commission and the Fish and Wildlife Service. The two agencies are collaborating with other state and federal agencies and five power companies to restore the Susquehanna's historic shad fishery.

March & April at Field Museum

March 16 through April 15

New Exhibits

"MARITIME PEOPLES OF THE ARCTIC AND NORTHWEST COAST." Opening April 24. Members' Preview 1 to 9 p.m., April 22 and 23. This spectacular exhibit compares and contrasts the life and culture of the Northwest Coast Indians and the Eskimos. The five galleries of the exhibit deal with environment and history, hunting and collecting, the village and society, the spiritual world, and art. Within each of these gal leries are dioramas, colorful artifact displays, study areas, and video presentations. Hall 10.

Continuing Exhibits

HALL OF AFRICAN MAMMALS. Discover the surprising variety of African mammals, from the huge bongo or forest hog to the dainty klipspringer, in preparation for the lecture, "Predators and Their Prey: The Serengeti." Two of Field Museum's best known dioramas are here: the Man-Eating Lions of Tsavo and the African Waterhole. The African Waterhole, the Museum's largest habitat group, includes the giraffe, gazelle, zebra, and rhinoceros.

HALL OF ANCIENT EGYPTIANS. Field Museum's Egyptian exhibit, one of the country's best, has been improved by the addition of a new exhibit area, "In the Shadow of the Pyramid." You may now enter tomb chapel rooms built over 4,000 years ago and a replica of the chapel of Nakht, on loan from the Metropolitan Museum of Art. Other exhibits detail life in prehistoric and early historic eras of Egypt. Photomurals explain how the tomb chapels came to Field Museum. Among the most compelling objects in the older area are the human and animal mummies. Hall J.

Continued on back cover

EDITH FLEMING
946 PLEASANT
OAK PARK ILL 60302

March & April at Field Museum

March 16 through April 15

Continued from inside back cover

New Programs

RAY A. KROC ENVIRONMENTAL LECTURE. "Predators and Their Prey: The Serengeti." Sunday, March 28, 2 p.m. Award-winning photographer and author Baron Hugo van Lawick describes the incredible variety of animal life which includes more than 100 species of mammals and 500 of birds, inhabiting Serengeti National Park, in Tanzania, Africa. As a Serengeti area resident for 14 years, he has been able to capture the circle of life and death among the animals with vivid language and beautiful photographs. Members: $3. Nonmembers: $5.

EDWARD E. AYER FILM LECTURE SERIES. The Spring 1982 series of these popular adult-oriented travel films is beginning at a new time—1:30 p.m. Admission is free through the West Entrance. Doors open at 12:45 p.m.

March 20: "In the Footsteps of Richard Halliburton," with William Stockdale
March 27: "China After Mao," with Jens Bjerre
April 3: "The Galapagos," with John Wilson
April 10: "Paris and the Seine," with Kathy Dusek

WEEKEND DISCOVERY PROGRAMS. Tours, craft projects, slide presentations, and films which use Field Museum exhibits as a springboard for new insights into natural history projects are featured on Saturdays and Sundays. March's "Film Feature" subject is mammals from around the world.

March 20 1:30 p.m. *Saga of the Sea Otter*, a "Film Feature."
March 21 1:30 p.m. "Egypt's Middle Kingdom: Tombs, Art, and Literature," slide lecture.
March 27 1:30 p.m. *Baobab: Portrait of a Tree*, "Film Feature."
March 28 1:30 p.m. "Tutankhamun: Discovery and Treasures of the Tomb," slide lecture.
April 3 12:30 p.m. "Public and Private Life in 18th Dynasty Egypt." slide program.
2 p.m. "American Indian Dress," tour.
April 10 "Ancient Egypt," tour.

SPRING JOURNEY. "A Touch of Field Museum." This self-guiding tour covers such touchable exhibits as bones, meteorites, and polar bears. Free *Journey* pamphlets available at Museum entrances.

"Maritime Peoples of the Arctic and Northwest Coast"

Special Programs

NORTHWEST COAST LECTURE SERIES. "A Culture Develops." The concluding two lectures in this series are designed to enhance the visitor's appreciation of Field Museum's newest permanent exhibit, "Maritime Peoples of the Arctic and Northwest Coast," which opens April 24. Each lecture is individually complete and given by a leading authority on native cultures of the Northwest. Entrance for these 8 p.m. lectures is through the West door. Members: $3. Nonmembers: $4.

March 19 "Adaptations: Cultural Variations," by Wayne Suttles, Portland State University, Portland, Oregon.
March 26 "Cosmology, Role of the Shaman," by George MacDonald, University of British Columbia, Museum of Anthropology, Vancouver, British Columbia.

LEARNING MUSEUM COURSE. "Arts of Tide and Tundra: An Arctic and Northwest Coast Perspective." Dr. Robert Grumet, visiting lecturer and anthropologist, compares and contrasts the traditional art forms of the Northwest Coast Indians with those of the Eskimos through striking slide presentations, the use of authentic artifacts and traditional music. The course meets for six consecutive Tuesday evenings at 7 p.m. beginning April 13. Advance registration now being accepted. For more information, call 322-8854. Members: $40. Nonmembers: $45.

CONTEMPORARY ARTS SYMPOSIUM. "Echoes of the Past, Tides of Change." Five noted Northwest Coast Indian and Eskimo artists discuss modern trends influencing their art. Together the artists speak authoritatively about the state of North America's richest and most famous artistic heritage. A related Learning Museum event. Sunday, April 18, 1:30 to 3:30 p.m. Members: $6. Nonmembers: $8.

Continuing Programs

MARCH AND APRIL HOURS. The Museum is open every day, 9 a.m. to 5 p.m. except Fridays. On Fridays the Museum is open 9 a.m. to 9 p.m. throughout the year.

THE MUSEUM LIBRARY is open weekdays 9 a.m. to 4 p.m. It is closed March 15 and Good Friday, April 9. Obtain a pass at the reception desk, main floor.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

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COVER

Northwest Coast masks on view in Gallery IV, "Spiritual World," in the exhibit "Maritime Peoples of the Arctic and Northwest Coast," opening April 24 in Hall 10. (Members' preview April 22, 23.) Exhibit case shown on front cover contains Kwakiutl masks; that on the back cover contains masks of the Tlingit, Haida, and Tsimshian. Photo by Ron Testa.

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THE NORTHWEST COAST COLLECTIONS

LEGACY OF A LIVING CULTURE

by PETER L. MACNAIR

Increasingly, museums are being scrutinized for the way in which they present and interpret ethnographic material, and rightly so, for the attitudes of the past often reflect a cultural imperialism that is generally not acceptable today. Examination of the records of any museum established in the nineteenth century demonstrates clearly an attempt to amass a large, comprehensive collection of a way of life that was rapidly passing. Where collecting had a scientific basis and was guided by qualified personnel, the results were gratifying and provide helpful information for today's student of material culture. Regrettably, other institutions sought to impress by sheer numbers alone and such collections and the display of them remain little more than cabinets of curiosities.

The discipline of anthropology was still very much in its infancy at the end of the nineteenth century, but pioneers like Franz Boas were leading the study into a respectable social science. Material

Early photo of diorama of Hámatsa, or cannibal dance, of the Kwakiutl, as it appeared when first installed in 1904. The diorama may be seen again today in Gallery IV, Hall 10. Neg. 16242. (Color detail shown on p. 18.)

Peter L. Macnair is curator of ethnology at the British Columbia Provincial Museum, Victoria, B.C. At the opening of Field Museum's new exhibit, "Maritime Peoples of the Arctic and Northwest Coast," Mr. Macnair will serve as the official representative of the Province of British Columbia. He will lecture on "Kwakiutl Winter Ceremonies" on Friday, May 14, at eight o'clock.

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Hámatsa dress worn by Bob Harris (left) and Charles Nowell (right), both Kwakiutl Indians, at 1904 St. Louis Exposition.

culture was a legitimate interest within anthropology and the systematic approach to identifying materials from which the objects were made, describing their use, and recording their social context, was an appropriate curatorial activity. Such documentation justified the need to preserve apparently dying arts and customs for future generations.

Inspired by the material culture of Indian and Eskimo peoples who visited Chicago to demonstrate their exotic lifeways at the World's Columbian Exposition of 1893, Boas helped establish the collection that forms the core of the Field Museum's holdings. In many respects his information about the material of the Northwest Coast Indians is unequalled, and for this the active participation of native people in collecting and identifying it must be recognized. Boas' primary native associate was George Hunt, from the northern Vancouver Island Kwakiutl village of Fort Rupert. Rigorously trained to record myths, legends, technology, and ceremonial events in both English and his native language, Hunt provided a legacy of information that will continue to overwhelm those seeking to use his contributions.

The Boas-Hunt tradition at the Field Museum was continued in the first decade of the twentieth century by a British Columbia-based medical doctor, Charles F. Newcombe, and his Kwakiutl collaborator, Charlie Nowell. In 1901, Newcombe was engaged to add to the Northwest Coast collection and to plan and prepare exhibits that would feature the culture of the people of this area. In 1902 he collected mainly Haida material and later added objects from other tribal groups.

Great expositions continued to hold immense public interest at this time and Newcombe took several Kwakiutl and Nootkan Indians to the St. Louis World's Fair in 1904. He and Charlie Nowell stopped off in Chicago on their return to the Pacific

Northwest to plan collecting strategy, identify certain objects, and to discuss the displays that Newcombe was to design for the Field Museum.

Not all the objects Newcombe required could be obtained from the field. As a result, Nowell and his Denaktok village associate, Bob Harris, created certain objects for the displays. The Newcombe correspondence reveals how Charlie was asked to make a (recently constructed) cradle "look old-fashioned" by eliminating the "whiteman's paint" used to decorate the piece.

Men such as Charlie Nowell had a vast sense of humour and a flair for the theatrical, and they must have greatly entertained those midwesterners whom they came to know through the museum project. And while performing and working for the whiteman, they retained a conviction that what they were offering was part of a real, living, and viable tradition.

Perhaps the incident of cannibalism at St. Louis is an indication of the spontaneous creativity and yet serious intent of these roguish early associates of the Field Museum. Among the many peoples brought to the fair were a group of pygmies. Bob Harris, the carver, was fascinated by them and befriended one by supplying him with extra food. The Kwakiutl, assisted by their Nootkan associates, staged a hámatsa, or cannibal dance for fairgoers. In this most prestigious of Kwakiutl performances, the dancer is said to be inspired by the spirit of a ferocious man-eating monster, who, at the beginning of time stole humans from a village and took them to his mountain fastness at the north end of the world to eat. Inflamed by this awesome spirit-power, the hámatsa dancer circles the floor of the ceremonial house and appears to bite the arms of certain members of the audience.

In time he is subdued by healing songs and the actions of attendants and is returned to a state of normalcy. As an alternative to the biting sequence, the dancer may enter holding a corpse in his arms and appear to eat it. Yet all of this was simply highly staged theatre.

But back to the troupe in St. Louis. Bob Harris was performing as hámatsa when the singers made a mistake in the song. This angered him and Charlie Nowell announced this fact to the sizable audience viewing the performance. Attendants sought to restrain the enraged dancer, but he escaped their grasp and rushed to a point on the stage where their pygmy friend sat. Harris seized the diminutive fellow and rushed behind a painted screen. Then he reemerged, handling his victim so roughly that the pygmy screeched in terror. The hámatsa then placed his captive on the floor and bit his neck so furiously that blood spurted over the stage. The Kwakiutl ended the presentation by cutting strips of flesh off the corpse and eating them.

By all reports the crowd was outraged. Consta-

Haida totem pole model carved by Charles Edenshaw, c. 1900. Cat. 79696.

Northwest Coast whistles, Gallery IV.

bles had to restrain the unfortunate victim's people from attacking with spears. If Nowell is to be believed, a distraught Newcombe muttered that it was murder and Harris would be hanged for certain. Ever the orator, Charlie Nowell announced that his people had done a great thing and had acted according to the dictates of the winter dance.

Somewhat later the group proceeded to their on-site dance house which quickly filled with fair officials and curious onlookers. Harris danced around the fire, shaking his rattle and singing. Then he moved towards the remains of the unfortunate, at this point covered by a mat, and sang an incantation over the body. As he sang, Nowell translated the words, indicating successively, "that flesh was now back on the bones; that the body was entire; and that the body was finally quite warm." The covering was suddenly flung aside and the victim sat up stiffly and slowly began to unlimber his body. Charlie rose before the audience and addressed them as follows: "I am very glad to learn that our friend here, Bob Harris, done this great thing. You all saw him when he ate the flesh of this little man that is standing by his side. This is the same man that was dead, and his flesh was all eaten up. Now he has his flesh and his life back, and now he is alive. And I am glad that there will be no law that will come against us." (From "*Smoke from Their Fires, The Life of a Kwakiutl Chief*," by Clellan S. Ford, Yale University Press, Inc., 1941.) Sensing the drama of the situation, Newcombe stood up and delivered a lengthy speech in which he detailed the elaborate theatrical achievements and other considerable accomplishments of the Northwest Coast peoples.

Bob Harris was obviously a master of the theatrical prop. Even today his carving skills are remembered. One informant claims his talent was so considerable that when he completed a carving of a grizzly bear, it transformed into a living animal. Harris died shortly after this incident. He was a man who had explored his stagecraft to the point where people believed it became real, foreshadowing his demise.

Happily, Nowell reveals the secret of their amazing performance. Over several days Harris carefully observed the pygmy and created a like mannequin; he carved a head from wood and modeled a body by scrupulously dissecting and rearticulating a sheep's carcass, the "body" was then smoked as a finishing touch. He simulated the victim's cry with a whistle manufactured of wood and reed and filled a bladder with animal blood for the final effect.

Bob Harris and Charlie Nowell are but a few of the great Northwest Coast Indian artists, singers, orators, and chiefs of the recent past who are still remembered today. In part, they are recalled through archival records and anthropological publications but they also survive in the memories of those still living who had the good fortune to know the leading men and women of two or three generations past. There were many who successfully bridged two worlds and made both all the richer for it.

What of the forebears of those native people who strove to help provide us with a written record of their magic world? As far back as earliest Euro-american contact with the northwest coast of North America, certain personalities emerged to be identified and described. The majority were chiefs who quickly sought to control all communication with the strangers and their novel trade goods. When Captain James Cook landed on Vancouver Island's west coast in 1778, he came to know the Moachat Nootkan Chief named Maquinna. Cook entered ob-

Northwest Coast potlatch (detail), Gallery III.

servations about him and his people in his journals; his staff artist, a man named John Webber, sketched various village scapes, house interiors and portraits, leaving an invaluable record. Some two decades later an English-born ship's armorer sailing aboard an American vessel was captured and enslaved by the same Maquinna for a period of two years. The enslaved John Jewitt was eventually rescued and survived to publish his memoirs, which have since proved useful in attempts to reconstruct the history of the early contact period in Maquinna's territory.

Other Euroamericans followed, some like Captain George Vancouver to assiduously chart the North Pacific Coast of the continent. Others came to exploit the sea otter trade, finding they could sell the lustrous pelts in China for huge profit. In time, this source of income was slaughtered to a point of near extinction and the maritime fur trade collapsed. However, it was quickly replaced by a more permanent land-based fur trade. This saw the advent of the Hudson's Bay Company in 1820, and fortified trading posts soon dotted the coast, continuing to offer a wide variety of manufactured goods.

All this while the Indians remained in ascendency, manipulating trade to their own advantage and always outnumbering the whites. Then in 1862 tragedy struck. A ship from San Francisco reached Fort Victoria with a passenger aboard suffering from smallpox. Indians from along the entire length of the coast were visiting Victoria and most contracted the dread disease. As they made their way northward, often ill and disspirited, they were attacked by other groups who became unwitting victims themselves. Unscrupulous traders entered villages filled with decaying corpses, stripped blankets from bodies and moved on to the next healthy village to repeat the cycle. This unhappy chapter in British Columbia's history was quickly over for want of victims to work upon. Within two years, more than one third of the native population of what is now British Columbia died. The ravages of gunpower, alcohol, mumps, measles, chickenpox,

tuberculosis and other infectious diseases also took their toll, so that by 1929 the province's native population reached an all-time low. This figure of 22,600 was down from a precontact estimate of 85,000. The Haida living on the Queen Charlotte Islands suffered most dramatically; they were reduced from a probable 8,000 to 588 souls in 1915. Given these figures, recovery or retention of traditional culture seemed impossible. Yet, people have tenaciously held on, maintaining as much as possible despite the onslaught of disease, and religious and civil suppression so that today rebirth becomes significant.

While common aspects of culture and environment link the people living on the coast of northern California to southeastern Alaska, major distinctions exist. Unifying factors include the tractable, versatile red cedar tree, which provides most of life's needs: bark for clothing and rope; branches and roots for withe and basketry; and the sturdy trunk for houseplanks, canoes, boxes, totem poles, utensils, and ceremonial objects.

The other constant in this distinct cultural and ecological area is the salmon. Five species of this anadramous fish spawn in rivers and streams, the larger of which penetrate the Coast Range and permit access as far as the Rocky Mountains. Additional fauna and flora contribute importantly to life on the Northwest Coast although salmon and cedar prevail.

Yet even in the epicenter of this natural province vast discrepancies occur. Certain gulf islands in Puget Sound and Georgia Strait receive so little rainfall that a species of cactus actually flourishes in isolated rocky areas. At about the time the cactus is blooming some of the northernmost straits are choked with flotillas of icebergs, calved off from glaciers at the head of fjords.

While it is easy to create the impression of a moderate climate and an abundance of food, hunger and even starvation were not unknown to the coastal peoples. The farther north one travels, the more rigorous becomes the food quest. The range in climate between the northern and southern borders is significant; on the Fraser and Columbia Rivers, summer-caught salmon can be preserved by drying in the hot canyon air. To the north, the much more labor-intensive method of smoking fish is required, as the flesh will not cure in the cooler, moister atmosphere of an Alaskan summer.

Within the vast area are peoples whose linguistic origins cover at least six language families. Anthropologists prefer to describe these gross categories as linguistic groups and from north to south they include Tlingit, Haida, Tsimshian, Kwakiutl, Bella Coola, Nootkan, Coast Salish, and Chinook. But we are dealing with such a time depth here that mutually unintelligible languages have developed within these general categories. For example, there are actually nine separate languages among the Coast Salish group although all are ultimately derived from a common tongue.

Given the differences in environment and culture there is at least one universal denominator and that is the sea. Its moods range from raging surf flung by a winter's storm onto the jagged rocks of the exposed outer coast to protected inland waterways in summer as still as the sun at noon. Myriad islands add miles of coastline offering both harbor and succor. Through these passages Indian people ventured, travelling hundreds of miles to trade, intermarry, or make war.

The summer's activities of gathering and fishing saw people disbursed throughout the territory often functioning independently as small family groups in their pursuit of food. But as winter approached and gales mixed sea spume and rain as one, people drew back to the permanent winter villages and began an intense, introspective life dominated by the presence of ancient spirits that left their mountain, heavenly and mythical retreats to surround the villages during the sacred winter season.

At this time people assume a new order, introducing personal names that are used only in the ceremonial season. Society is ranked in a manner that often differs from that of the secular summer months. The mythic encounters of ancestors acquired through descent, marriage, or warfare are reenacted according to rigid privilege and if disputes of ownership occur, intensely competitive gift-giving may result in an attempt to gain supremacy over a rival.

While the majority of dance dramas relate to the time when the world was young and animals could turn at will into human form and back again, others,which on one level appear to be myths,relate to actual events.

One lineage of Nishga people living on the Nass River have a mask that when manipulated causes the nose to extend almost two feet. The nose is a telescoping device, controlled by strings. Its use recalls a legend that saw a monster step from a cave and by extending its nose across a river valley, save a village from a threatening lava flow. The lava beds are very much in evidence today and geologists indicate the eruption occurred no more than 300 years ago. Such cataclysmic events demand explanation and in time they become vested in myth.

When a family intends to display, assume, or transfer jealously guarded prerogatives, they invite witnesses to view the event. The presentation of a series of dances could continue for several weeks during which time guests must be fed and housed by the host group. Displays might take place inside a cedar plank house designed to accommodate as many as 500 people. Here, at night, illusion was enhanced by the flicker of firelight. Interplay of light

and shadow was created by the fire which alternately highlighted and obscured the magnificent sculptural planes of carved masks and other stage properties. Actors fell into the fire, were horribly burned and then miraculously made whole. Women were beheaded and then recreated. Sea monsters festooned with kelp came trumpeting out of the sea while small birds flew through the dance house calling to one another.

Once the dance privileges were shown, the host was required to distribute food and wealth goods to his guests. By accepting the gifts, which were presented according to rank, the guests acknowledged their host's claim to his entitlements. Thus, the host's status was validated by the public witness of his guests.

The apparent orgy of gift-giving horrified civil and religious authorities, who petitioned the Canadian government to ban the institution known as the potlatch. Legislation was first attempted in 1884 but it was not until the early twentieth century that individuals were successfully charged and jailed for participating in events that encompassed all aspects of society: ceremonial, religious, ritual, economic, and social.

Tremendous moral and legal pressure was put upon Indian people to give up their old ways. The fires of the human heart grew dim, yet many persisted and were able to carry over important knowledge of language, culture, and tradition to the present day. In 1951 the Canadian Indian Act was rewritten and the repressive sections against the potlatch were simply deleted. Descendents of the determined few are again standing where Charlie Nowell and Bob Harris once stood. As did their forebears, they have contributed substantially to the creation of a magnificent new exhibit and have demonstrated that the cooperation with native peoples established as a precedent more than 75 years ago continues to be a hallmark of the Field Museum.□

Carved argillite dish, Haida. Diam. 13 7/8 inches; 1894 gift of J. L. Gould. Cat. 17952. Neg. 102063.

FIELD MUSEUM STORE

GALLERY 9

Museum Members and the general public are invited to a new exhibition selling of the finest art works by top artists and craftsmen of the Arctic and Pacific Northwest. The gallery opening coincides with the opening of Hall 10.

Artists represented include:

Primrose Adams
Larry Avakana
Steve Brown
Joe David
Robert Davidson
Dorothy Grant
Calvin Hunt
Henry Hunt
Tony Hunt
Tony Hunt, Jr.
Nathan Jackson
John Livingston
Melvin Olanna
Duane Pasco
Katie Pasco
Selina Peratrovich
Bill Reid
Cheryl Samuel
Jim Schoppert
Joe Senengetuck
Ron Senengetuck
Norman Tait
Art Thompson

All from British Columbia, Alaska, and Washington, their works here assembled present a stunning array of talent never before seen in Chicago. Included are wood carvings, masks, jewelry, totems, baskets, weavings, serigraphs, and button blankets.

Gallery 9 Hours: 11-5 or by special appointment.

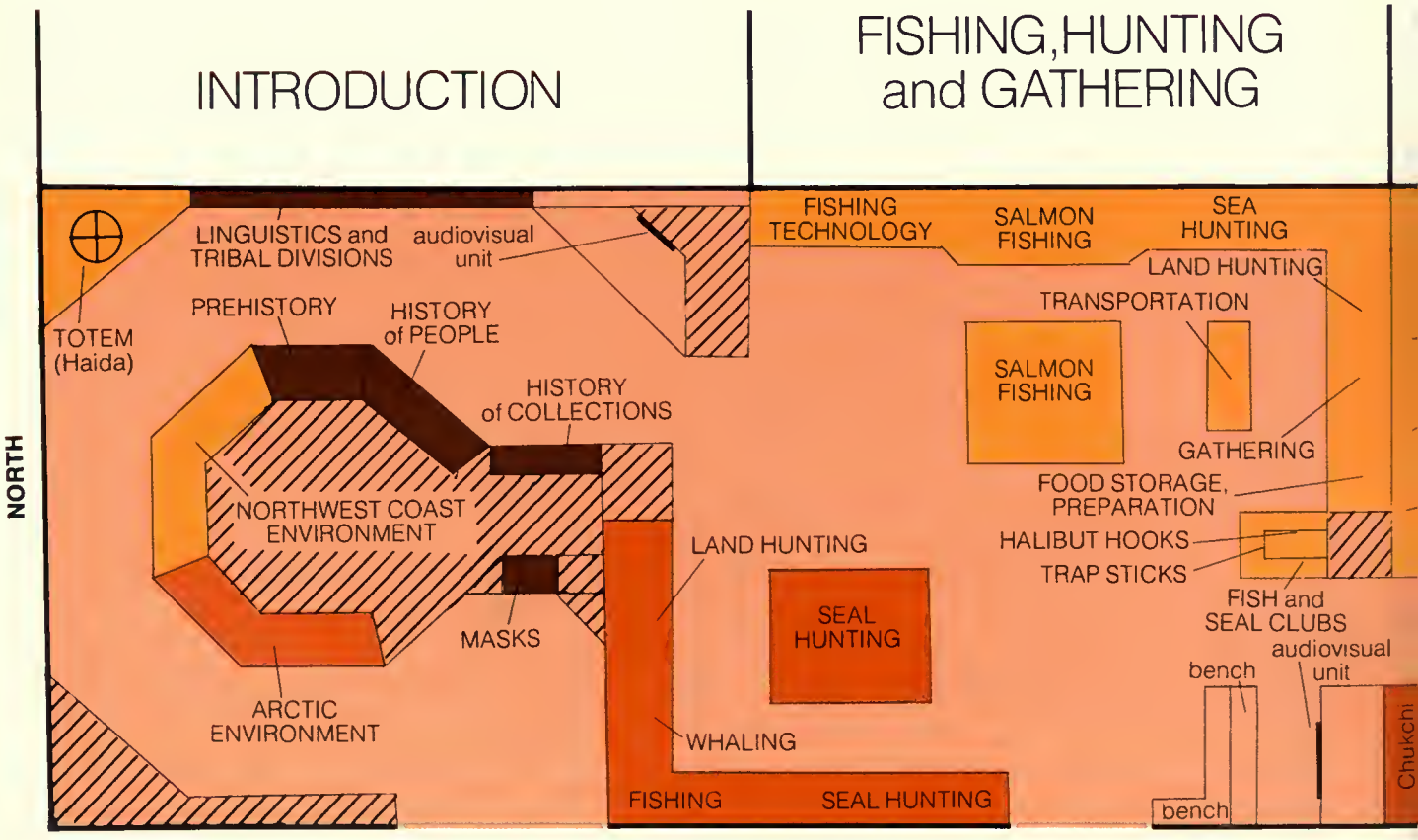
Museum Store Remodeled

The Museum Store, newly remodeled, is again open. A new section, featuring choice items related to special exhibitions, currently features a wide variety of merchandise from the Arctic and the Pacific Northwest or related to the cultures of those regions.

Gallery III, "Village and Society." Portion of exhibit showing personal adornment and clothing of Eskimos. Ron Testa photo.

Gallery III, "Village and Society." Portion of exhibit featuring ceremonial dress of Northwest Coast peoples is shown. Robe in center belonged to Kasawak (Edwin Scott), a Haida chief. Behind the robe, on the wall, is a Haida button blanket. Ron Testa photo.

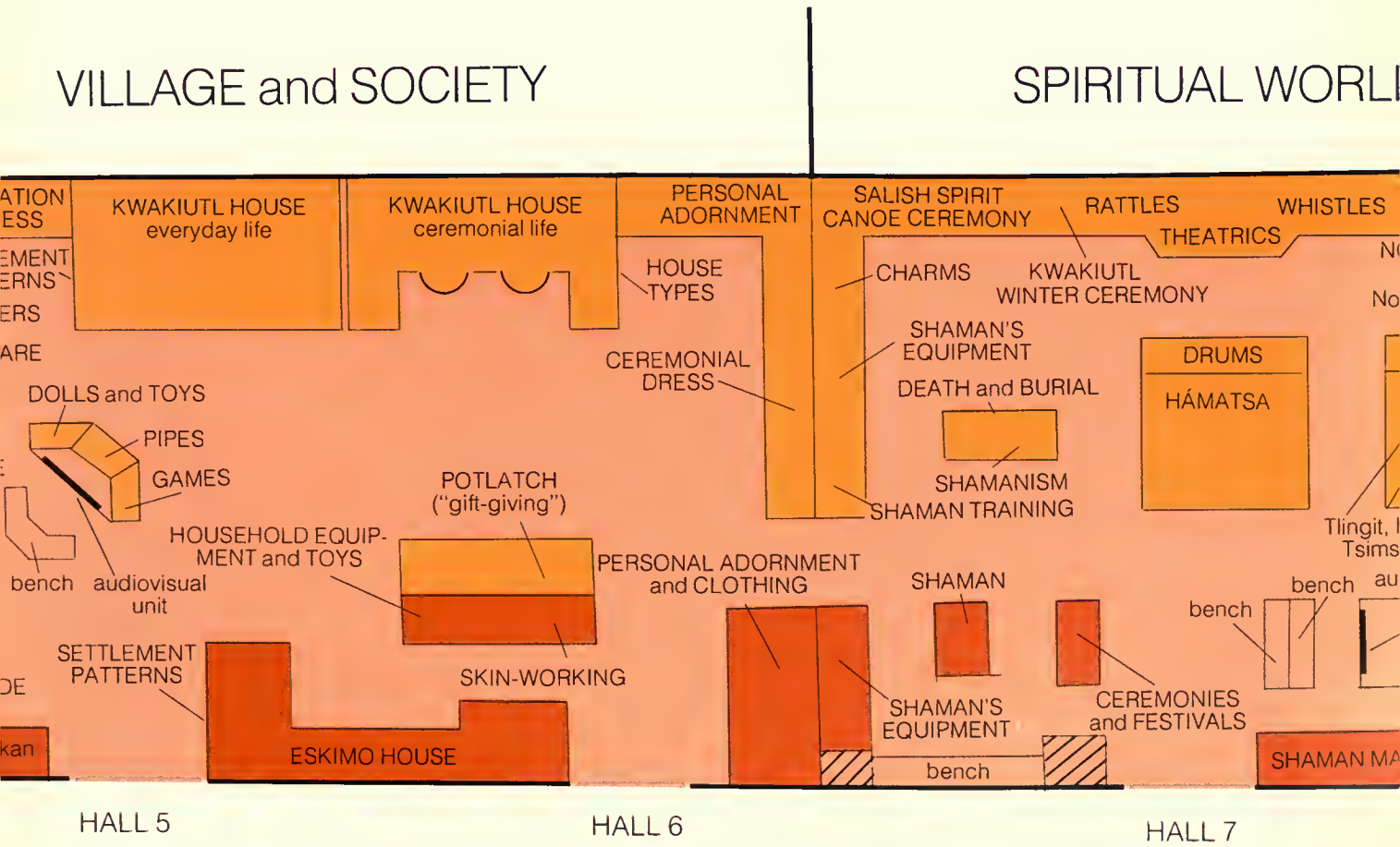
MARITIME PEOP



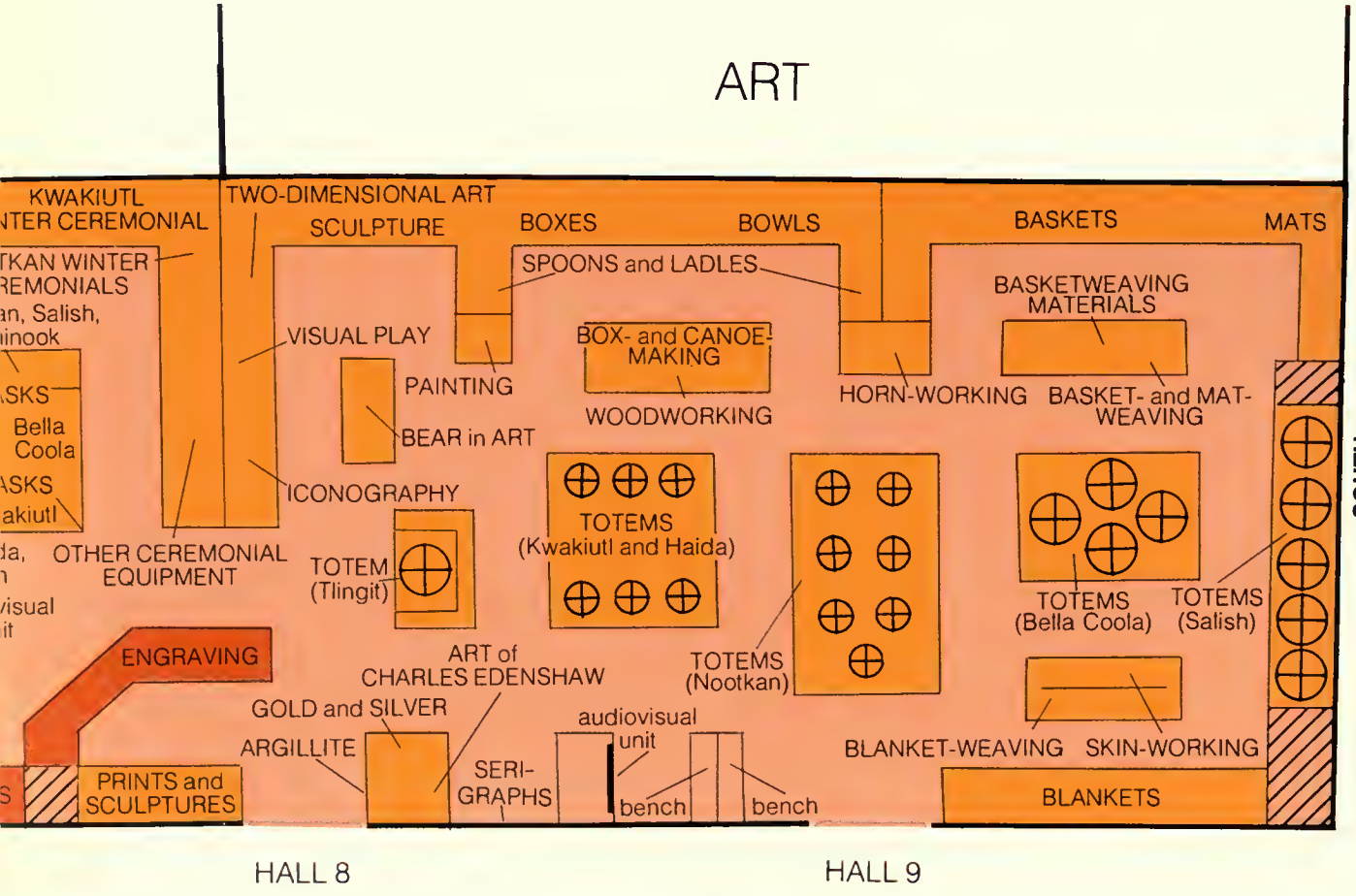
Peoples of the Northwest Coast
Eskimo Peoples
Eskimo and Northwest Coast Peoples

LES OF THE ARCTIC & NORT

Hall 10



HWEST COAST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BOX- and CANOE-
MAKING
WOODWORKING
HORN-WORKING
BASKET- and MAT-
WEAVING
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OTHER CEREMONIAL
EQUIPMENT
TOTEM
(Tlingit)
TOTEMS
(Kwakiutl and Haida)
TOTEMS
(Bella Coola)
TOTEMS
(Salish)
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(Nootkan)
ENGRAVING
ART of
CHARLES EDENSHAW
GOLD and SILVER
ARGILLITE
audiovisual
unit
SERI-
GRAPHS
bench
bench
BLANKET-WEAVING
SKIN-WORKING
PRINTS and
SCULPTURES
BLANKETS
SOUTH
HALL 8
HALL 9

Gallery IV, "Spiritual World." Life-size representation of Eskimo shaman dancing. Ron Testa photo.

Gallery IV, "Spiritual World." Diorama of Hámatsa Society ceremony (Kwakiutl). The diorama was constructed in 1904, its seven mannequins reproduced from life casts made on Vancouver Island, B.C., in 1899. Ron Testa photo.

ALASKAN

NATIVE CULTURE TOUR FOR MEMBERS

June 18-July 2

June 18: Fly from Chicago to Anchorage, transfer to Sheraton Anchorage Hotel. City tour, including Fine Arts Museum, then dinner at historic Club 25. Overnight Sheraton Anchorage Hotel.

June 19: Flight to Kotzebue, with day tour and overnight first class hotel.

June 20: Depart for Nome; day tour of Nome. Depart for Anchorage; overnight Sheraton Anchorage Hotel.

June 21: Depart early morning by motorcoach to Denali National Park (formerly McKinley). Afternoon and evening free for National Park Service slide shows and demonstrations, overnight first class hotel in park.

June 22: Early morning wildlife tour in park; early afternoon motorcoach to Fairbanks. Overnight Captain Bartlett Hotel.

June 23: Special tour and lecture for Field Museum by University of Alaska, on ivory and totem carving, agriculture, permafrost construction, oil development, economic situation, etc. Overnight Captain Bartlett Hotel.

June 24: Fly Fairbanks to Whitehorse. Yukon River raft trip and outdoor BBQ dinner. Overnight at Travelodge.

June 25: Day-long trip on narrow-guage railway to Skagway. Free time to sightsee, then to Klondike Hotel for overnight.

June 26: 5-hour boat curise to Juneau; to Baranof Hotel for overnight, with stop at Mendenhall Glacier enroute. Late afternoon walking and van tour, including historic district, gold mine, government buildings; outdoor salmon bake dinner. Overnight Baranof Hotel.

June 27: Morning tour of Alaska State Museum. Afternoon program on Alaska Native Land Claims Settlement Act and current native economic conditions. Board cruise ship *M.V. Statendam* in late afternoon. Meals on board begin with dinner. Cruise ship departs 11:00 p.m. (*Statendam* is 25,000-ton luxury liner.)

June 28: Day of cruising on Glacier Bay; lecture room provided to the group.

June 29: Port of call: Sitka. Special tour of Sheldon Jackson Museum, National Park Service exhibits, totem collection, Russian Orthodox church, Baranof Castle site.

June 30: Cruising off British Columbia coast.

July 1: Arrive in Vancouver by *Statendam* in morning. Special tour of Vancouver, highlighting Northwest Coast Indian art; overnight Bayshore Inn.

July 2: Fly from Vancouver to Chicago.

This tour is limited to 30 persons (double occupancy), and includes for the tour price of $3,700 (single supplement: $400) a lecturer and escort; all lodging, sightseeing, and transportation; best hotels available in each city; class D, E, and F outside cabins on the cruise ship; meals in the itinerary plus all breakfasts and all meals on the *Statendam*; all ground tours and transfers in exclusive vehicles and specially done for the Field Museum group with 30 participants. With 15-29 participants, tours will be done exclusively, but transfers may be combined with other travelers.

Our tour leader will be Dr. Margaret B. Blackman, associate professor of anthropology at SUNY-College at Brockport, New York, an authority on native cultures of the Northwest Coast and Alaska.

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

D Walsten

MARITIME PEOPLES OF THE ARCTIC AND NORTHWEST COAST

A New Permanent Exhibit in Hall 10

by Carolyn Blackmon and Ronald L. Weber

Maritime Peoples of the Arctic and Northwest Coast marks a new era for Field Museum. It is the first major permanent collection to be reinstalled in over forty years, and it signifies the beginning of a new exhibit renovation program.

The Northwest Coast Indian and Eskimo collections are of high importance for their richness and diversity in materials, design, craftsmanship, and regional variation. Collected primarily for the World's Columbian Exposition of 1893, the artifacts represent these cultures between 1850 and 1920.

The five galleries within the exhibit follow a structured approach to man in his several cultural modes: people live within a space—their environment; they use their environment to obtain food by fishing, hunting, and gathering; they devise shelter, live in villages, and form a structured society; they deal with the spiritual world and explain their existence on the basis of religious belief; tools are

GALLERY III. Cutaway replica of Kwakiutl house, with daily-life furnishings.

Carolyn Blackmon is chairman of the Department of Education, Ronald L. Weber is visiting assistant curator, Department of Anthropology.

made and decorated, and works of art are created.

The Museum has used an innovative effort in combining the artifacts with appropriate information. The challenge was to determine types of visitor use and needs across the spectrum of organized school groups to the casual visitor. A strategy was devised to present three levels of information that support the main themes. Level I is reflected in the individual gallery titles and large dynamic exhibits that present a major concept or idea. Level II exhibits, surrounding the central theme, are concerned with the many separate stories that support the main idea. These exhibits contain labels that often call out special interest items. Level III provides peripheral study areas that display similar objects which were used for a specific purpose. The exhibit floor plan (center spread, pp. 14-16) provides an overview of the strategy.

Assigning appropriate names for tribal and other cultural groups within the context of the exhibit, was not a routine matter. Some Canadian Eskimos prefer to be known as *Inuit*, meaning "real people" in their language. The Algonkian word *Eskimo*, meaning "raw flesh eaters," is the only term that properly designates all of the native inhabitants of the arctic area from Alaska to Greenland. So *Eskimo* has been used in the exhibit for all people of this region. The misconception that all Eskimos share a close, common identity derives from an external viewpoint; there is no single expression used

GALLERY II. Alaskan Eskimo fishing equipment.

Ron Testa

Gallery V. Northwest Coast basketry.

by Eskimos that lumps all of them together in such a convenient fashion.

The same linguistic problem prevailed in finding suitable cultural tags for peoples of the Northwest Coast area. Today, those who speak the Nootkan language prefer to be known as "West Coast People" (west coast of Vancouver Island). The word *nootka* has no meaning in their language. But because the designation "West Coast People" may be too easily confused with "Northwest Coast People," the name Nootkan—meaning Nootka speakers—has been used throughout the exhibit.

D Walsten

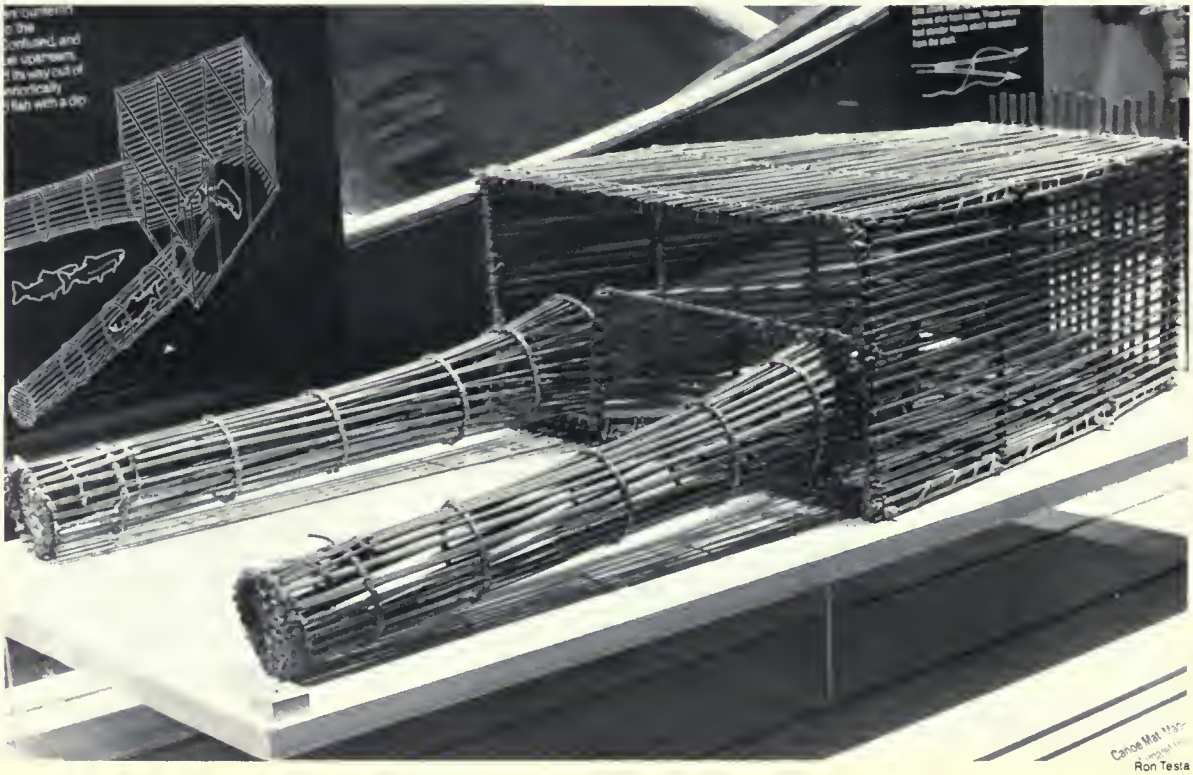
Introduction

In the first two miniature dioramas, dealing solely with the natural environment of the Arctic and Northwest Coast, man is absent. However, the resources which man depended upon are included in detail. In "Prehistory," man is introduced into both the Arctic and Northwest Coast areas. "History of Peoples" shows the history of European contacts with Arctic and Northwest Coast peoples, from a European as well as an Indian perspective, and "History of Collections" considers how the collection originated. A short film about the peoples of Alaska and the Northwest Coast as they live today completes the Introduction.

Fishing, Hunting, and Gathering

The two central dioramas present the chief subsistence activities of the Eskimo, (sea hunt-

Gallery II. Model of Nootkan salmon trap.



Ron Testa

D. Walsten

GALLERY IV. Alaskan Eskimo shaman masks.

GALLERY V. Alaskan Eskimo walrus tusk engraving. Two lower pieces are carved as cribbage boards.

ing) and of Northwest Coast peoples (salmon fishing). Level II cases show fishing technology, food gathering, and transportation, among others. A 16-foot Nootkan style salmon fishing canoe is on view, complete with paddles, boxes, and hooks. The boat was built specially for the new exhibit by Lance Wilkie, a Makah Indian of Neah Bay, Washington; baskets and mats made by Margaret Irving, also a Makah, of Neah Bay, have been placed in the canoe.

Level III study areas contain halibut hooks, trap sticks, and clubs for use on seals and fish. The Eskimo side of the gallery contains materials concerned with land hunting, whaling, fishing, transportation, and the hunting and utilization of the seal. This gallery joins Hall 4, where one may find general information on Pre-Columbian American Indian food gathering patterns.

D. Walsten

VILLAGE AND SOCIETY

The replicas of Eskimo and Kwakiutl houses are constructed in cutaway fashion. On the Northwest Coast side are the two side-by-side Kwakiutl house

replicas, identical in structure; the first contains the materials of daily life, the second is arranged for ceremonial activities. In the daily-life replica, fronted with glass, a woman in calico tends a fire as she prepares to roast mussels. In the house's sleeping room, left rear, two men are passing the time at gambling. A mixture of traditional and European goods are to be seen about the house. The houseposts have the raven crest on top.

The ceremonial house is a walk-in exhibit, furnished only with an elaborately designed, portable, three-sectioned ceremonial dance screen that features the raven crest. A large, circular hole in the screen's center reveals a number of masks behind it. The houses were constructed on site for the exhibit by Kwakiutl Indians Tony and Calvin Hunt, and John Livingston; the masks were made by Doug Cranmer and Richard Hunt, also Kwakiutls.

On the west wall we find a cutaway replica of a subterranean Eskimo house. The Village and Society gallery enters directly into Hall 5, which contains the Museum's renowned Pawnee earth lodge. Thus, three distinct North American house types, all within close proximity to one another, may be readily compared. Settlement patterns, house types, trade, warfare, clothing, personal adornment, toys, games, and pipes are also here. An exhibit of the potlatch (gift-giving) prepares the visitor for the next gallery, the Spiritual World.

Spiritual World

To the right we see a representation of an Eskimo shaman dancing. A few steps beyond, and to the left, we are confronted by the arresting figure of a Kwakiutl Hámatsa initiate and dancer emerging from a dance screen. This diorama, with seven life-size mannequins, was completed in 1904. The figures were modeled from life casts made on Vancouver Island in 1899. Nearby cases provide

Gallery IV. Accoutrements of Kwakiutl winter ceremony.

D Waisten

GALLERY I. Diorama of Northwest Coast environment.

information on shamanism, curing, and the winter ceremony. Beyond the Hámatsa diorama we come upon an awesome collection of spectacular masks, arranged by region of origin.

ART

Twenty-three towering totem poles and houseposts carved by Tlingit, Haida, Bella Coola, Kwakiutl, Salish, and Nootkan artists dominate the area. Exhibits include animal crests, two- and three-dimensional art forms, transformation themes in art, and the working of wood, horn, skin, argillite, and metals. The division of labor between men and women is treated in sections on mat-making, basketry, and blanket-weaving. An exhibit of serigraphs, hand-silk-screened prints, features the current renaissance of Northwest Coast art. A case devoted to the artist as an individual presents works by John Robson, Charles Edenshaw, and his descendant the contemporary Robert Davidson. The gallery also contains works by John Cross, Doug Cranmer, Joe David, Stan Green, Bill Reid, Roy Vickers, Johnny-Kit-Elswa, and Xa'niyus (Bob Harris), in addition to many fine pieces by unknown artists.

Level III study areas containing boxes, bowls, spoons, baskets, mats, and blankets display superb pieces of artistry and craftsmanship. Since Eskimo artists generally work on a small scale, ivory engraving and stone-carving, the section dealing with their creations is on a correspondingly small scale. Among the contemporary Eskimo artists represented are Kingmeata, Kakulu, and Joseph Senungetuk.

Major funding for "Maritime Peoples of the Arctic and Northwest Coast" has been provided by grants from the National Endowment for the Humanities, with additional funding from the National Endowment for the Arts, Chicago Park District, the Barker Welfare Foundation, the Robert R. McCormick Charitable Trust, and the Frederick Henry Prince Testamentary Trust.□

April & May at Field Museum

April 16 to May 15

New Exhibits

"MARITIME PEOPLES OF THE ARCTIC AND NORTHWEST COAST." Hall 10. A dramatic new, permanent exhibit opens April 24! This innovative exhibit compares and contrasts the theatrically ornate cultures from the North Pacific Coast with the austere but individualistic Eskimo societies. Situated along the 5,000-mile coast of the Northern Pacific and Arctic oceans, these two distinct cultures have adapted to differing environments by using similar techniques to harvest the riches of the rivers and oceans.

Enter the Introductory Gallery (I) from Hall 3 on the northeast corner of Stanley Field Hall. Here the lush forested Northern Pacific area is compared to the barren tundra of the Arctic. The Northwest Coast Indians and the Eskimos both lived by hunting and fishing; they never depended on agriculture. How they hunted, fished, and gathered from the land and sea is explained in Gallery II. Full-sized house replicas of each group are featured in the Village and Society Gallery (III). The Spiritual World Gallery (IV) defines the inter-relationships of the human, animal, and spiritual world. In the final gallery (V) the stunning art of the Northwest Coast Natives and Eskimos is dramatically presented. The towering totem poles and tiny scrimshawlike engravings exemplify the rich artistic heritage of these groups.

Here is an exhibit you'll enjoy at a leisurely pace, but will want to return to again and again.

Gallery Nine. Special exhibit area in front of Hall 9. An art gallery for viewing and purchasing. The work of the 21 modern Northwest Coast and Eskimo artists on display represents an exciting renaissance in their art. From April 24 to May 25.

Museum Bookstore. Look for the newly remodeled Museum gift and book shop facilities when visiting the Maritime Peoples exhibit.

"Maritime Peoples of the Arctic and Northwest Coast" Special Programs

CONTEMPORARY ARTS SYMPOSIUM. "Echoes of the Past, Tides of Change." Five noted Northwest Coast Indian and Eskimo artists speak authoritatively about the state of North America's richest and most famous artistic heritage. A related Learning Museum event. Sunday, April 18, 1:30 to 3:30 p.m. Members: $6. Nonmembers: $8.

NORTHWEST COAST LECTURE SERIES. "Strategies of Society: Social Organization." The second lecture series concentrates on the social structures of Northwest coast tribes and how their art is integrated into those societies. You may attend the whole series or any individual lecture. Each lecture is given by a leading authority on native cultures of the Northwest. Entrance for these 8 p.m. lectures is through the West door. The series is $9 for Members and $12 for nonmembers. Single lecture is $3; $4 for nonmembers. May 14: "Kwakiutl Winter Ceremonies," by Peter Macnair, Curator of Anthropology, British Columbia Provincial Museum, Victoria, British Columbia.

Opening Festivities

MEMBER'S PREVIEW. Hall 10. April 22 and 23, from 1 p.m. to 9 p.m. Hilary Stewart, consultant for the exhibit's labels will be on hand to discuss the exhibit. The West Coast Singers and Dancers from British Columbia will perform on Thursday only (April 22) from 4 to 5 p.m.

POLE RAISING. Outside Museum's North entrance at 1 p.m. In honor of this new exhibit, Field Museum will erect its first outdoor artifact—a 55-foot totem pole named "Big Beaver," carved by Nishga artist Norman Tait. The pole-raising will be accomplished with traditional native ceremonies. April 24 at 1 p.m.

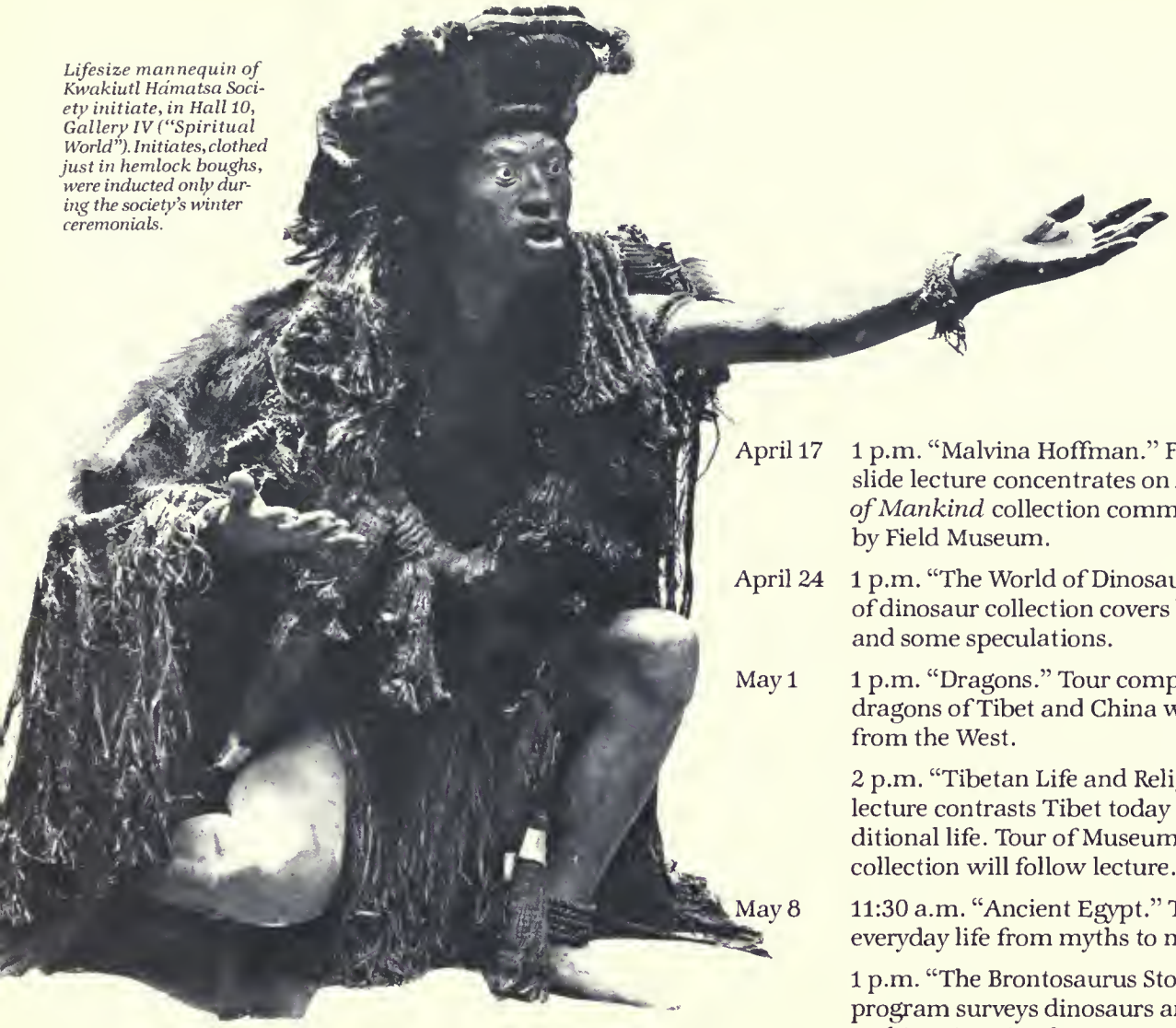
CEREMONIAL DANCES. Stanley Field Hall. A group of Nishga dancers will perform dances like those which commemorate important events in tribal life, to dramatize the totem pole raising. April 24 and 25 at 3 p.m.

KWAKIUTL DANCES. Stanley Field Hall. See a Museum exhibit come to life! Kwakiutl winter ceremony dances will be performed just as they are pictured in the exhibit. April 25 at 11 a.m.

CRAFT DEMONSTRATIONS. Stanley Field Hall. Some of the Kwakiutl and Nishga dancers are also excellent artists. They will demonstrate in a variety of media using regional materials such as wood, bone, and grasses. April 25 at noon.

New Programs

DINOSAUR SCAVENGER HUNT—A Weekend Family Program. Participants can go on a "dig" in Field Museum's Dinosaur Hall (Hall 38) by using a specially prepared self-guided tour. Volunteers and staff will be on hand to help families discover more about these fascinating creatures. Tour



Lifesize mannequin of Kwakiutl Hámatsa Society initiate, in Hall 10, Gallery IV ("Spiritual World"). Initiates, clothed just in hemlock boughs, were inducted only during the society's winter ceremonials.

begins at the head of the Apatosaurus, the largest dinosaur, in Hall 38. April 17 and 18 from 1 to 3 p.m.

EDWARD E. AYER FILM LECTURE SERIES. The Spring 1982 series of these popular adult-oriented travel films is beginning at a new time—1:30 p.m. Admission is free through the West Door. Members receive priority seating.

April 17: "South and East Africa" with Ted Bumiller.

April 24: "Himalayan Odyssey" with Frank Klicar.

SPRING JOURNEY. "A Touch of Field Museum." This self-guiding tour covers such touchable exhibits as bones, meteorites, and polar bears. Free *Journey* pamphlets available at Museum entrances.

WEEKEND DISCOVERY PROGRAMS. Tours, craft projects, slide presentations, and films which use Field Museum exhibits as a springboard for new insights into natural history projects are featured on Saturdays and Sundays. Check *Weekend Sheet* available at Museum entrances for added programs.

April 17 — 1 p.m. "Malvina Hoffman." Film and slide lecture concentrates on *Portraits of Mankind* collection commissioned by Field Museum.

April 24 — 1 p.m. "The World of Dinosaurs." Tour of dinosaur collection covers basic facts and some speculations.

May 1 — 1 p.m. "Dragons." Tour compares the dragons of Tibet and China with those from the West.

2 p.m. "Tibetan Life and Religion." Slide lecture contrasts Tibet today with traditional life. Tour of Museum's Tibetan collection will follow lecture.

May 8 — 11:30 a.m. "Ancient Egypt." Tour explores everyday life from myths to mummies.

1 p.m. "The Brontosaurus Story." Slide program surveys dinosaurs and other prehistoric animals.

2 p.m. "Malvina Hoffman." Film and slide lecture.

May 15 — 3 p.m. "Life in Ancient Egypt." Tour introduces newly installed exhibit and describes practices of Nile Valley inhabitants such as mummification.

Continuing Programs

VOLUNTEER OPPORTUNITIES. Individuals with scientific interests and backgrounds are needed to work in various Museum departments. Contact the Volunteer Coordinator, 922-9410, ext. 360.

APRIL AND MAY HOURS. In April, the Museum is open daily 9 a.m. to 5 p.m., except Fridays. During May, the Museum is open every day 9 a.m. to 6 p.m., except Fridays. On Fridays, throughout the year, the Museum is open 9 a.m. to 9 p.m.

THE MUSEUM LIBRARY is open weekdays 9 a.m. to 4 p.m. Obtain a pass at the reception desk, main floor.

MUSEUM TELEPHONE: (312) 922-9410

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

May 1982

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COVER

Hollow bronze representation of the ancient Egyptian god Horus in form of a falcon. The bird wears the sacred cobra, or uraeus, emblematic of sovereignty, and the double crown of united Egypt. Eyes are overlaid with gold. About actual size. On view in case 17, Hall J. Gift of Stanley Field and Ernest R. Graham. Cat. no. 173231.

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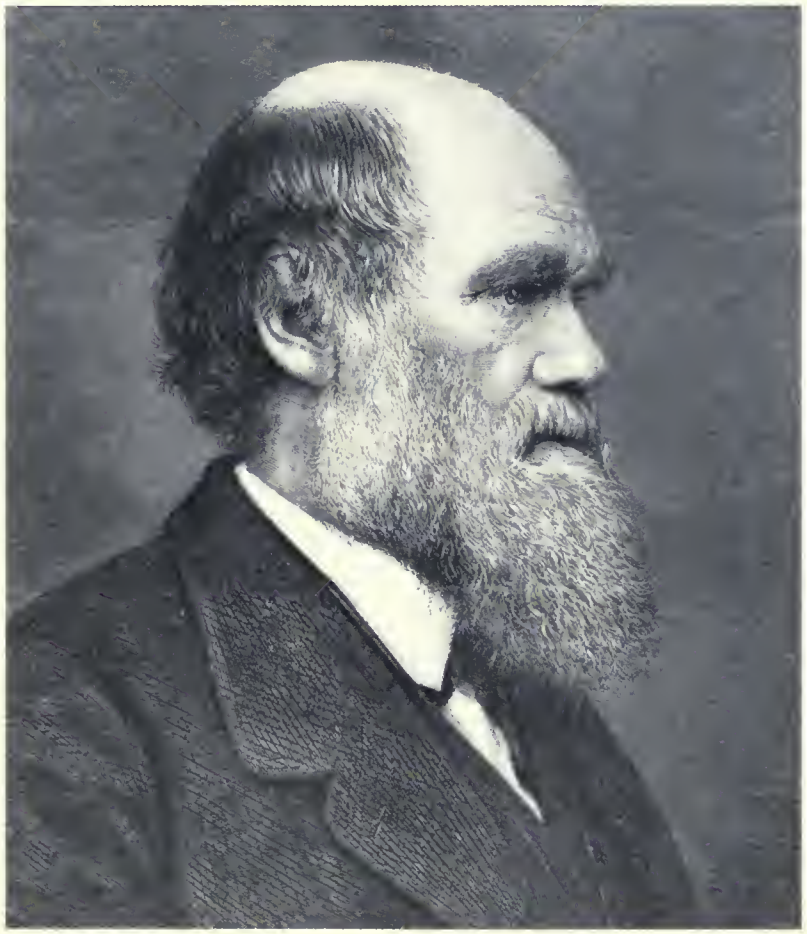
Charles Darwin: A Tribute from the Standpoint of Modern Evolutionary Theory

by BRUCE D. PATTERSON
Assistant Curator, Division of Mammals

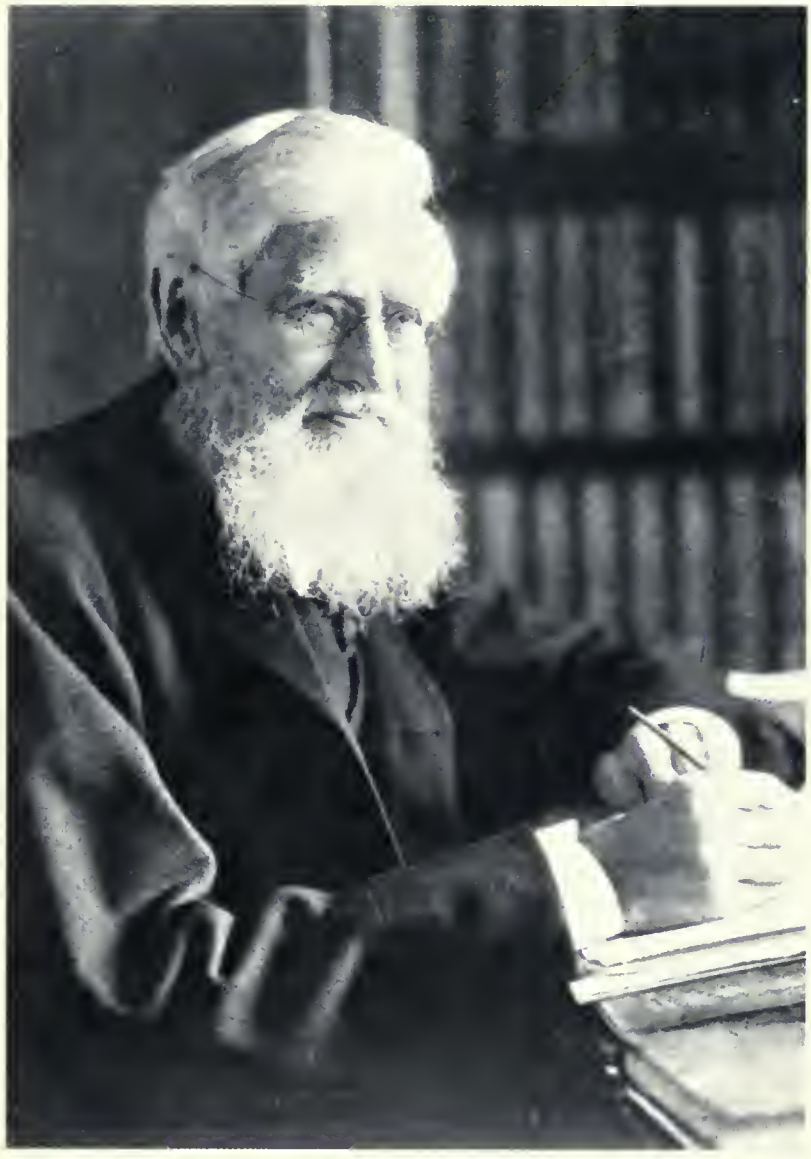


Charles Darwin, age 61

On April 19, 1882, Charles Darwin died; he was in the 74th year of his life. Plagued by infirmities for much of his adult life, Darwin had led a life of quiet reflection at his family home in Down, England. Darwin's thinking was to produce a revolution in the way in which we view nature and ourselves. Perhaps no other scientist in history has so radically reordered human awareness. The centennial of Darwin's death presents an occasion for the celebration of human achievement and genius.

Darwin's insights into evolutionary phenomena were nothing short of remarkable. His theory of evolution via natural selection was simplicity itself: 1) All biological populations are variable in myriad characteristics relevant to survival and reproduction; this variability is in part heritable. 2) Each biological population produces vastly greater numbers of offspring than are necessary for the replacement of the parental population (Darwin calculated that the descendants of a single pair of slow-breeding elephants would number more than 19 million after as little as 750 years, were each to survive and reproduce). Thus, 3) there must be a constant "struggle for existence" in which favored variations come to predominate in populations via differential survival and reproduction. While the two tenets of evolution via natural selection were well established prior to Darwin, it took

Bruce Patterson, who joined the Field Museum staff in 1981, is the recent recipient of the James H. Davis Prize, awarded by the Graduate School of New Mexico State University, Las Cruces, for his doctoral dissertation.



Alfred Russel Wallace (1823-1913), co-discoverer of the theory of evolution by natural selection.

Darwin's genius to combine them in such a way as to conclude that living organisms should be embroiled in unceasing evolutionary change.

The inherent plausibility of evolution by natural selection was, however, not sufficient to sway a skeptical scientific and public audience. Darwin opened his first notebook on facts in relation to the origin of species in July, 1837, shortly after returning from the now-famous voyage of the *H.M.S. Beagle*. He was to spend much of the following two decades amassing evidence for his ideas on the mutability of species. During this period of incubation, Darwin wrote numerous scholarly works, on such disparate topics as the formation of coral reefs, the nature of earthquakes, the actions of earthworms, and the systematics of barnacles.

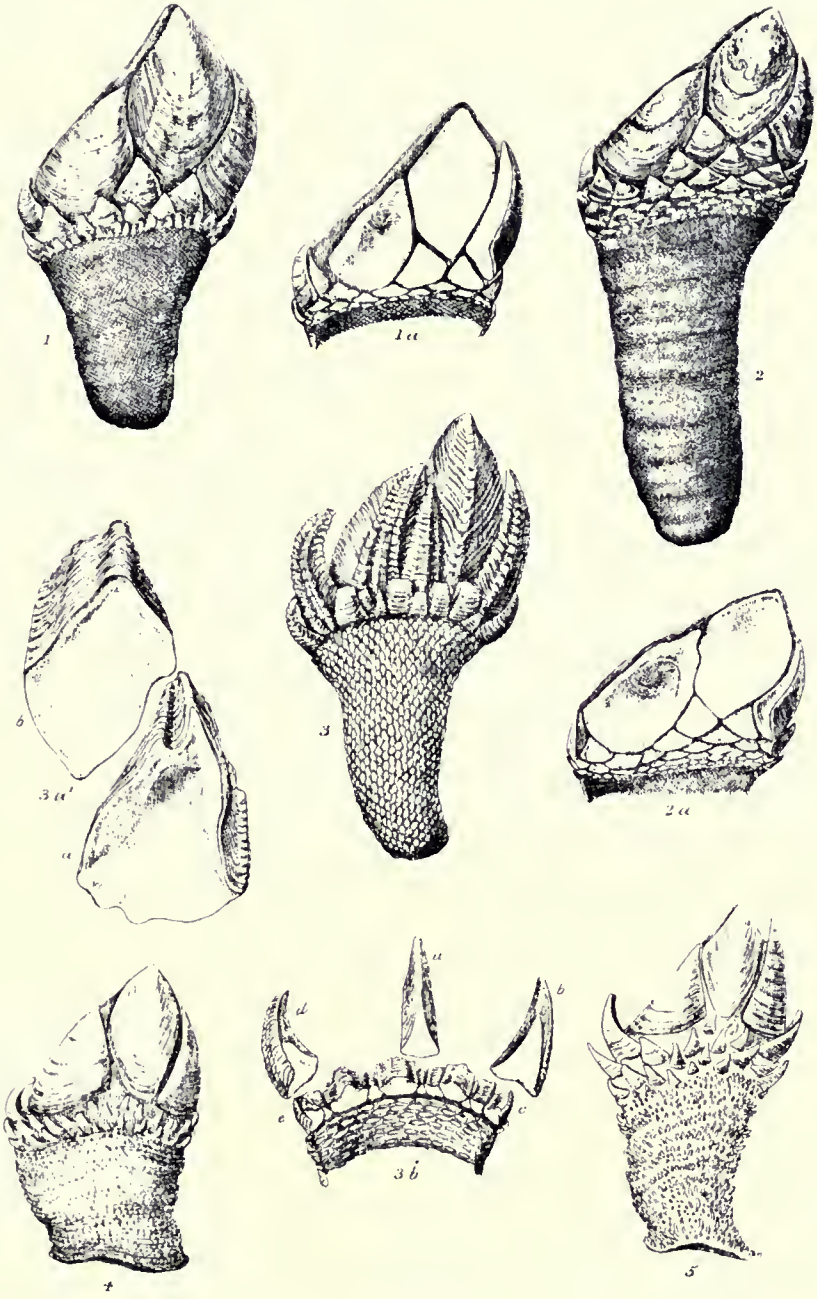
Darwin's theory on the origin of species was presented to the scientific community in abstract form in the company of a nearly identical, but independently derived, version written by Alfred Russel Wallace. The two papers on natural selection were published simultaneously in the *Journal of the Proceedings of the Linnean Society* in 1858. Much later, Darwin was to write that "our joint publications excited very little attention....This shows how necessary it is that any new view should be explained at considerable length in order to arouse public attention."

The *Origin of Species*, the single most influential work of Darwin's career, was published the following year, in November, 1859. The first edition of 1,250 copies sold out on the day of publication, and a second edition of 3,000 copies soon afterwards. By 1876, 16,000 copies of the book had been sold in England, and translations of the book had appeared in most European languages. In his personal letters, Darwin referred to this work as an "abstract" of a longer, more definitive work on the same subject—perhaps the *Origin* can be seen as an abstract of all his scientific work, the theme about which his various studies were drawn.

The 1860s saw the publication of four other books by Darwin. These were followed in February, 1871, by the publication of the *Descent of Man*. In the introduction to that work, Darwin stated: "During many years I collected notes on the origin or descent of man, without any intention of publishing on the subject, but rather with the determination not to publish, as I thought that I should thus only add to the prejudices against my views. It seemed to me sufficient to indicate, in the first edition of my 'Origin of Species,' that by this work 'light would be thrown on the origin of man and his history'; and this implies that man must be included with other organic beings in any general conclusion respecting his manner of appearance on this earth." Emboldened by the general acclaim given the *Origin* by contemporary scientists, Darwin published the application of this general theory to human evolution.

The *Descent of Man* produced a radical change in human perception of the natural order, overthrowing the concept of man's sovereignty over nature that had prevailed in philosophy since the dawn of civilization. By affirming our kinship with nature, our place amid countless other species of organisms in a system of ever-branching genealogy, Darwin stole our dominion but bequeathed us an extended family. More than a century later, we still feel the profound impact of this philosophical revolution.

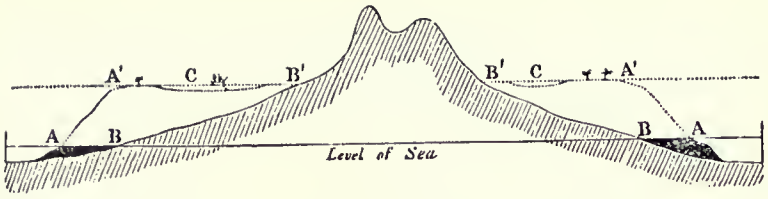
We at Field Museum are especially indebted to Charles Darwin. His theory of evolution makes intelligible a vast body of scientific observations: it defines the way in which we view the interrelationships of organisms, and even the way that specimens are arranged in our research collections (scientists use genealogy as an order-



Darwin spent eight years (1846-54) studying various species of barnacles, and published two large monographs on the subject. Those shown here are from an 1851 edition. In his autobiography he noted that "The Cirripedes form a highly varying and difficult group of species to class; and my work was of considerable use to me, when I had to discuss in the Origin of Species *the principles of a natural classification."*

ing principle much as librarians use the Library of Congress classification system). Many of the questions Darwin raised in the nineteenth century still persist as the most fundamental and challenging questions in biology. These questions serve as focuses of scientific debate, and comprise the basis for much of the research conducted by curators at the Field Museum. Among them are:

- What is the tempo of evolutionary change? Does evolution proceed by gradual, incremental, and continous changes, or is change a sudden phenomenon followed by extended periods of evolutionary tranquility?
- Why are there gaps in the fossil record, where we look for evolutionary intermediates? Are these attributable to imperfections of the fossil record or to the mechanism of evolution?

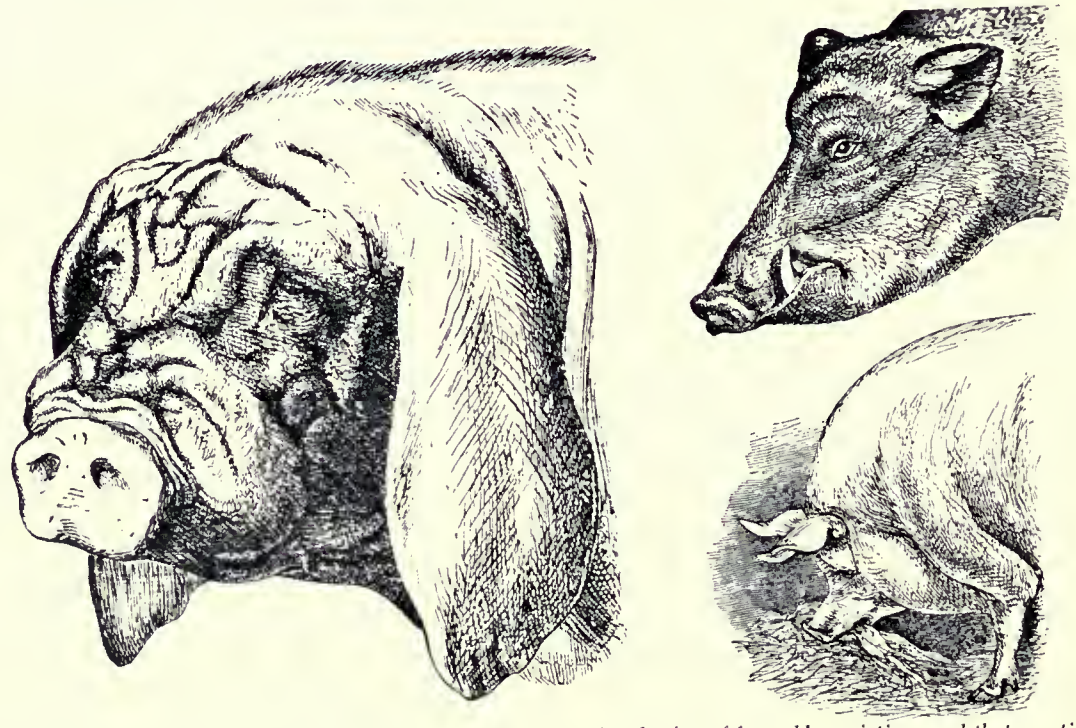


Darwin's view of the formation of barrier reefs and atolls in consequence of the subsidence of islands was first published in 1842; an initial stage in this geological process, shown here, is from that study. Darwin later wrote "No other work of mine was begun in so deductive a spirit as this, for the whole theory was thought out on the west coast of South America, before I had seen a true coral reef. I had therefore only to verify and extend my views by a careful examination of living reefs".

- What is the basis for major evolutionary novelties (such as the power of flight or image-forming eyes)? Do these result from a steady accumulation of minor genetic changes or from the single occurrence of a "macromutation?"
- How much of evolutionary change can be attributed to adaptation, and how much must be ceded to historical artifacts, structural correlations, and genetic drift?
- Is there a tendency toward greater complexity of organization or perfection in evolutionary sequences? Are evolutionary survivors more adapted than extinct forms, or were they luckier in avoiding randomly occurring extinctions?
- What are the units of selection? While natural selection clearly operates among individuals of a population, can it also operate at the level of genes, chromosomes, populations, and species?
- How closely should biological classifications reflect relationships based on descent ("cladism") versus relationships based on similarity ("gradism")?
- What is "altruism" in an evolutionary sense? Do units of selection ever behave in such a way as to endanger their own prospects of genetic representation in subsequent generations?
- What is the role of competition in ecological communities? Is competition an on-going process or do competitive problems demand evolutionary solutions?
- What is the basis for species abundance? Why are some species rare and others greatly abundant?

In 1979 and 1980, the research staff at Field Museum published more than 120 books and articles on natural history. (To give some notion of scale to this production, the 21 papers published in *Fieldiana*—the Museum's continuing monograph series—totalled almost 3,400 pages!) Virtually all of these works have bearing on evolutionary theory, serving to further develop and refine Darwin's vision of life. The enormous research efforts directed towards evolutionary theory by scientists at Field Museum and elsewhere serve as testaments to Darwin's genius and understanding.

Darwin closed his *Origin of Species* on a philosophical note that has become the basis for biophilosophy, or the philosophy of life: "There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved."□



Darwin clearly perceived the underlying similarity between nature's selection of favorable variations and that practiced by farmers and ranchers everywhere; this analogy was central to his theory. "Variation under domestication" was the title of the first chapter of the Origin of Species *as well as the subject of a book published in 1868, from which this illustration is taken. The science of genetics, which would subsequently prove fully complementary to Darwin's theory, was also an outgrowth of the study of domesticated varieties.*

Field Museum Library Holdings of the Works of Charles Darwin

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The Zoology of the Voyage of the H.M.S. 'Beagle,' Under the Command of Captain Fitzroy, R.N., during the Years 1832 to 1836. London: Smith, Elder and Co., 1939-1943.

Geological Observations on the Volcanic Islands and Parts of South America Visited during the Voyage of H.M.S. 'Beagle.' 3rd. ed. New York: D. Appleton and Co., 1891.

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The Structure and Distribution of Coral Reefs. 3rd ed. New York: D. Appleton and Co., 1889.

The Origin of Species by Means of Natural Selection. 3rd. ed. London: John Murray, 1861.

On the Various Contrivances by which Orchids are Fertilized by Insects. 2nd ed., rev. New York: D. Appleton and Co., 1892.

The Movements and Habits of Climbing Plants. 2nd ed. New York: D. Appleton and Co., 1893.

The Variation of Animals and Plants under Domestication. 1st ed., 1st issue. London: John Murray, 1868.

The Descent of Man and Selection in Relation to Sex. 1st American ed. New York: D. Appleton and Co., 1871.

The Expression of the Emotions in Man and Animals. (n.i.). New York: D. Appleton and Co., 1894.

Insectivorous Plants. 1st American ed. New York: D. Appleton and Co., 1875.

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The Formation of Vegetable Mould, through the Action of Worms, with Observations on their Habits. 1st ed. London: John Murray, 1881.

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"A Monograph on the Fossil Lepadidae or Pedunculated *Cirripedes* of Great Britain." *Paleontographical Society,* 1851.

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Letters between Charles Darwin and Illinois Naturalist Benjamin D. Walsh. Original copies. (see *Bulletin of Field Museum of Natural History* 45(1):8-15)

plus a number of technical journals in which Darwin published his shorter works (*e.g. Journal of the Proceedings of the Linnean Society, Geological Society Proceedings,* etc.)

plus dozens of biographical and semibiographical works covering Darwin's role in the development of modern biological science

If several copies of a work are to be found in the Museum Library, the earliest edition is given here. Holdings are generally arranged by date of original publication. The notation "(n.i.)" indicates no additional publishing information is available.

Thinking Scientifically

The modern battle between evolution and creation science reveals that many people do not understand how science works

by JOHN TERRELL
Associate Curator of Oceanic Archaeology and Ethnology

"About thirty years ago there was much talk that geologists ought only to observe and not theorise; and I well remember some one saying that at this rate a man might as well go into a gravel-pit and count the pebbles and describe the colours. How odd it is that anyone should not see that all observation must be for or against some view if it is to be of any service!" This comment by Charles Darwin shows what the zoologist Michael Ghiselin has argued was the secret of Darwin's success: he was a man who thought. He reasoned imaginatively and carefully. He criticized his own ideas.

This quotation comes from a letter Darwin wrote in 1861 to Henry Fawcett, a radical Cambridge economist and follower of John Stuart Mill, the philosopher and logician. The letter dates from a time little more than three years after Darwin first made public his own controversial, some said radical, theory about the origin of new species of plants and animals by means of natural selection. The most important point in his comment is perhaps this one: *all observation must be for or against some view if it is to be of any service.* The philosophy of science implied by this statement—that facts, however diligently gathered, do not alone prove anything—was as controversial in the mid-nineteenth century as Darwin's views on the origin of species. Nowadays, of course, everybody knows that theories, hypotheses, and speculation are as basic to science as the most solidly established facts. Or do they?

For nine days last December Judge William Overton heard scientists and lawyers challenge Arkansas' new "creation science" law, Act 590. The law said creationism, based on the Bible, merited equal treatment with the teaching of Darwinian evolution in primary and secondary schools. Judge Overton ruled against the law: in his opinion, creation science was not science at all, nor did it fit general descriptions of "what scientists think" and "what scientists do."

Defenders of the law had argued that both creationism and Darwinian evolution are equally valid, alternative scientific models. Echoing Darwin's critics of more than a hundred years earlier, they noted that evolutionary theory could not be proved with certainty. Hence, they said, evolution—like creationism—is not a true scientific theory. Such an argument, however well-intentioned, reveals that people even today do not understand how science works.

Darwin respected the need for theories and hypotheses in scientific work, regardless how contrary to established thought and traditional common sense they might be. He was always on the lookout for facts. But once he had established a fact by what he thought was reasonable observation, he would at once begin to ask questions suggested by that fact to see if he could construct some tentative hypothesis which could explain not only that singular fact but might also be applicable to other cases. He would then proceed to see if his hypothesis did work in those other situations. As Darwin described his method of research: "my general line of argument" is one of "inventing a theory and seeing how many classes of facts the theory would explain."

Sometimes he rebuked himself for "my common error of being too speculative." But he knew better. As he wrote in 1857 to Alfred Russel Wallace, the co-discoverer of the theory of evolution by natural selection: "I am extremely glad to hear that you are attending to distribution in accordance with theoretical ideas. I am a firm believer that without speculation there is no good and original observation. Few travellers have attended to such points as you are now at work on; and, indeed, the whole subject of distribution of animals is dreadfully behind that of plants. You say that you have been somewhat surprised at no notice having been taken of your paper in the *Annals*. I cannot say that I am, for so very few naturalists care for anything beyond the mere description of species."

This last remark—that few naturalists care for anything beyond the mere description of species—sounds perhaps extreme. However, it may reveal Darwin's self-consciousness about the degree to which his research, and Wallace's, departed from accepted methods of inductive science.

The inductive approach in science is commonly traced back to the Elizabethan philoso-

Thomas Nast cartoon of Charles Darwin (rt.) and the founder of the Society for the Prevention of Cruelty to Animals. Caption reads: "The defrauded gorilla: 'That man wants to claim my pedigree. He says he is one of my descendants.' Mr. Bergh: 'Now, Mr. Darwin, how could you insult him?"

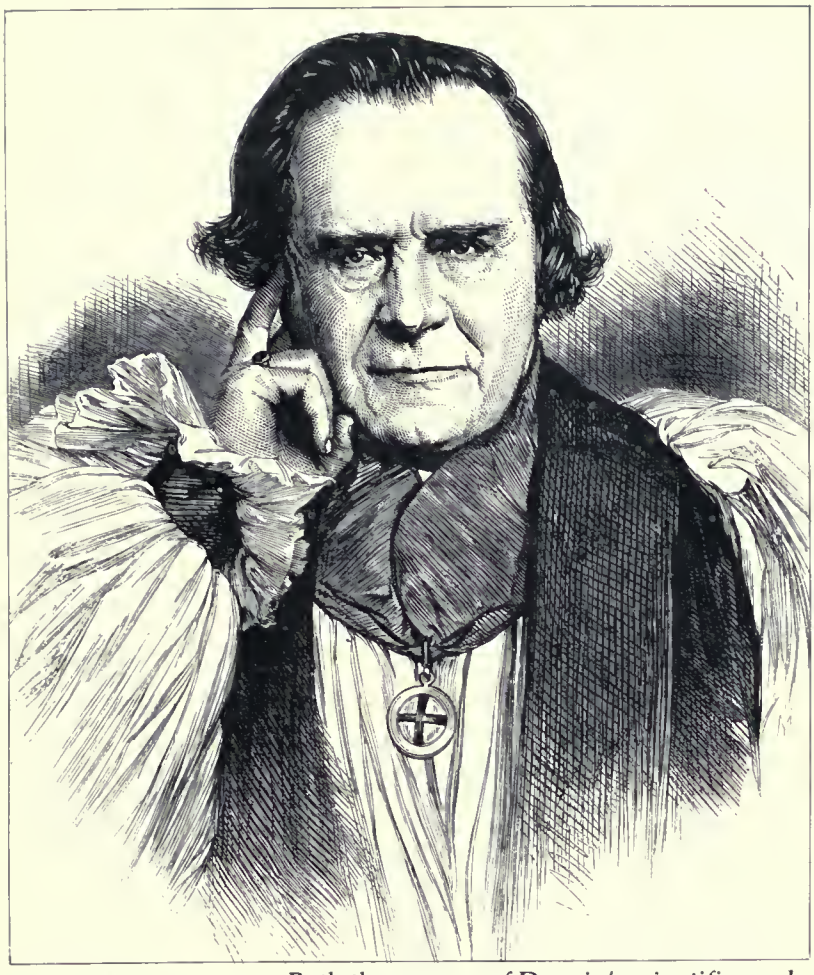
pher and statesman Francis Bacon, who railed against speculation, insufficiently founded on fact, in his book *The New Organon*, published in 1620. Simply described, the "new principles" set down by Bacon show how you can build an ideal argument from particular cases to arrive at true, scientific laws.

The historian David Hull reports that scientists and philosophers in the mid-nineteenth century were fully aware of the shortcomings of Bacon's logical approach. Science had not and could not progress solely according to his methods of true induction. Even so, during the last century someone who reasoned instead the way Darwin did, using the less formal but far more realistic logical process of give-and-take between fact and theory, was apt to be immediately suspect—especially if the ideas being put forward were as heretical as those of organic evolution. To a great extent, Bacon had set the tone for so rigid a view of proper scientific logic when he wrote: "Those, however, who aspire not to guess and divine, but to discover and know, who propose not to devise mimic and fabulous worlds of their own, but to examine and dissect the nature of this very world itself, must go to the facts themselves for everything."

Given this intellectual heritage, it hardly seems surprising that Darwin at times tried to impress his readers that his theory of evolution had grown more out of facts than clever speculation. He claimed in his *Autobiography* that he began his investigations on the evolution of new species in 1837 by working "on true Baconian principles, and without any theory collected facts on a wholesale scale." Only after fifteen months had passed in this way and after he happened to read for amusement Thomas Malthus's *Essay* on population did the idea of natural selection due to the struggle for existence finally occur to him, so that "I had at last got a theory by which to work."

This account does make it appear that Darwin discovered natural selection by gathering facts and letting them speak for themselves. But from all his writings, including his *Autobiography*, it is clear enough that the basic concepts of evolution had, in fact, already begun to form in his mind during his voyage on the *Beagle* to the South Pacific in 1831-1836. More than that, from his notebooks written in 1837 and 1838 it is known that he had struck on the idea of natural selection before reading Malthus.

After the publication of the *Origin of Species* in 1859 Darwin was genuinely disturbed by the harsh criticism he received. He had expected people to be abusive about *what* he had to say for he knew he was challenging fundamental beliefs about Creation and humankind's place in nature. But he was not prepared for the attacks against his *methods*. Some of the most respected scientists and philosophers of his day dismissed his ideas by saying his book was little more than pure conjecture and that he had *proved* nothing. There is little need to wonder why Darwin later warned his young friend John Scott, a gardener and self-taught botanist, to be "very sparing in introducing theory in your papers (I formerly erred much in Geology in that way): *let theory guide your observations*, but till your reputation is well established be sparing in publishing theory. It makes persons doubt your observations."



Samuel "Soapy Sam" Wilberforce, (1805-73), who defended Anglican Christianity against the Darwinian heresy.

Both the success of Darwin's scientific work and the bitter criticism leveled against his approach and his person point to a disturbing conclusion. The late biochemist and Nobel laureate Jacques Monod observed that the world of science can be divided into two camps: those for whom truth resides in solid objects, actually and fully present, and those who look beyond particular things for the ideal forms they represent. "There are but two kinds of scholars," concluded Monod, "those who love ideas and those who loathe them."

This judgment is unjust. The world of science and scholarship cannot be divided neatly into extreme opposing camps. But we should take a note of warning from Monod's observation. Evidently some people even within science become suspicious if they believe you are going beyond the facts. It may be too facile to say such persons "loathe ideas." But how then do facts and theories fit together in science?

A scientist's approach to the world is marked by three characteristics. First, science is based on *observation*. Regardless how skillfully you phrase your research questions or how clever your speculative ideas, if you cannot find a way to answer your questions or test your ideas by making observations, then you cannot properly be said to be "doing science." In short, while perhaps some scientists may loathe ideas, no scientist can embrace the option of loathing facts of observation.

While science is based on observation, it is generally understood that science is more than a collection of diligently gathered facts. As the mathematician Henri Poincaré wrote: "Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house." Thus, another characteristic of science is wanting something more than isolated facts. That is, the aim of science is to *generalize* about people and nature.

If you think about it, this aim is paradoxical, because these first two characteristics of science —observation and generalization—are contradictory; namely, scientists rely on their powers of observation to make generalizations about the world that can never be observed, because the conclusions of science are always about things in general, not things in particular!

This paradox is one that bothers many people. It does mean that even the simplest generalization is at least one step "beyond the facts." This is the reason for the great importance universally placed on a third characteristic of science. In the words of Poincaré again: "Every generalisation is a hypothesis."

What this means is that the process of making observations and forming generalizations never stops. Every scientific generalization is only provisionally "true," because you can never be absolutely sure that the next observation you make—which perhaps by all rights ought to be precisely like the ones you have been making —may not surprise you after all and turn out to be quite different, instead.

The importance of all three of these characteristics of science—observation, generalization, and hypothesis—is not always seen. For example, one of the supposed villians in the history of science is Bishop Samuel "Soapy Sam" Wilberforce. His role in defending Anglican Christianity against the Darwinian heresy is often cast as that of an ignorant, outmoded divine who fought and lost a hopeless rear-guard action against the superior forces of enlightened scientific truth. As Richard Wrangham of Cambridge University observed several years ago, however, Soapy Sam's protests actually show he believed natural selection to be a more powerful force than Darwin himself allowed. "To the Bishop natural selection maintained adaptation, and perfect adaptation reflected God's perfection. It was the imperfection of Darwinian natural selection, rather than its overwhelming power to affect species, which worried him."

Wilberforce wrote a lengthy review of Darwin's book for the *Quarterly Review* of July 1860

which Darwin declared "picks out with skill all the most conjectural parts, and brings forward well all the difficulties." In some respects modern creationists sound no different from Wilberforce, for he, too, claimed Darwin's theory was based on "the merest hypothesis, supported by the most unfounded assumptions."

Even if the Bishop's arguments against the *Origin* did on occasion find their mark, the lesson for us remains the same. Wilberforce believed that the complicated patterns of the organic world reveal Truth and the Power of God. Darwin, on the other hand, knew that all scientific generalizations, including those in the *Origin*, are only hypotheses ever in need of experiment and continual testing. Unlike the Bishop, he was content with something less than absolute truth. "My book has been well abused, praised, and splendidly quizzed by the Bishop of Oxford; but from what I see of its influence on really good workers in science, I feel confident that, *in the main*, I am on the right road."

We have now come to another quandary over which philosophers of logic and science have spent a great deal of time in argument and writing. Let us accept that the truth of a scientific idea is something that must be judged by seeing how well it organizes observations that have already been made and how well it sets us on the road to making new observations that ought to fall into line in some predicted way if we are at all on the right track. Then what are we to say about ideas that lead us to observations that we cannot make, either because we have not yet found the evidence needed to make them, or because we have not invented the tool that would let us see things in quite the manner required?

The biologist C.H. Waddington in his book *Tools for Thought* wrote that to use the scientific method effectively, you need to know how to ask important questions and then how to devise experiments that will give you clear-cut answers one way or the other. But as he observed, a clear, well-phrased question in itself is of possibly little use if there is no way of answering it. "It was no use asking perfectly clear and definite questions about the consistency of the moon's surface until there was some way of sending either a man or a probe up there to obtain an answer. Similarly, there are many questions about history and evolution which can be very definitely stated, but which will probably always remain unanswerable."

Waddington is a little misleading. There is no way you can be absolutely sure beforehand whether a question is answerable until you have asked it. Familiarity with a scientific subject and the sorts of questions that others have asked may equip you to ask useful questions that are probably answerable, too. But such a cautious pursuit of ideas is not likely to lead to truly startling discoveries.

Henri Poincaré (1854-1912), French mathematician, who wrote, "Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house".

Waddington's own conclusion, therefore, about the qualities of the talented scientist is hardly a useful instruction: "It is the ability to formulate clear-cut questions which invite yes-and-no answers, where a technique exists, or can be invented, to obtain these answers, which separates the successful scientist from the merely competent professional." This statement begs the issue, particularly when he adds: "or can be invented." An ironic illustration that this is so comes from Darwin's own career.

A month after the *Origin* was published, no less an old friend than the Rev. Adam Sedgwick, Darwin's former teacher of geology at Cambridge, wrote to him in complete dismay. "If I did not think you a good-tempered and truth-loving man, I should not tell you that . . . I have read your book with more pain than pleasure. Parts of it I admired greatly, parts I laughed at till my sides were almost sore; other parts I read with absolute sorrow, because I think them utterly false and grievously mischievous. You have *deserted*—after a start in that tram-road of all solid physical truth—the true method of induction, and started us in a machinery as wild, I think, as Bishop Wilkins's locomotive that was to sail with us to the moon."

One of Darwin's biographers, Sir Gavin de Beer, has remarked that Sedgwick attacked Darwin's methods because he could not successfully impugn his seemingly irreligious views by refuting his facts. Seen in hindsight, however, the Rev. Sedgwick could not have made a more unfortunate choice of analogy with which to damn Darwin's ideas than what he called Bishop Wilkins's "locomotive."

John Wilkins, theologian and preacher, scientific experimenter, Warden of Wadham College, Oxford, and ultimately Lord Bishop of Chester, was the single most influential organizer and popularizer of science—notably the new Copernican astronomy—in seventeenth century England. He was a founder of the Royal Society. And as author of *The Discovery Of A World In The Moone,* which first appeared in 1638, and several later works on science, Wilkins was the most important thinker of his century on manned flight as a scientific problem. It was he who forecast the invention of the aircraft—what Sedgwick called Bishop Wilkins's locomotive—and the development of space travel.

This incident from the life of Charles Darwin—with its ironic twist of fate that the person Sedgwick held up to Darwin as similarly misdirected is now seen as astonishingly foresighted—points to yet another feature of scientific thinking that is as significant as the others we have previously mentioned. Contrary to what Waddington seems to have been saying when he wrote that a clearly defined question is of no use if there is no available way of answering it, scientists cannot afford to limit their inquiries solely to those questions for which they expect or hope to find decisive answers that will settle matters once and for all.

For example, the fact that scientists had been trying to devise a single, unified theory of light since the seventeenth century without success—until the work of Planck and Einstein at the start of the present century—in no way lessens the significance of the research accomplished or the questions asked. Like it or not, scientists must face the fact of life that knowledge is rarely adequate enough to rule out all but one of the possible theories that could explain the same phenomena in different ways.

In short, one of the certainties of science is that most of the really interesting questions that we want to ask have more than one plausible answer. Indeed, as the history of thought bearing on the nature of light shows, we ought to be especially watchful when it looks as if competing theories can at last be reduced to one. After all, the rival "wave" and "corpuscular" theories of light waxed and waned in complementary fashion for two hundred years, only to be combined—paradoxically—into the ruling quantum theory of the present day. Need it be added that even the quantum theory of light is now subject to doubt and challenge?

Thus, to the three characteristics of a scientific approach to the world—observation, generalization, and hypothesis—we have now added two more. These are, first, the scientist's acceptance of his or her fate that one can never be 100 percent right on any question of real complexity and excitement; and second, the scientist's recognition that knowledge is rarely complete enough to rule out all but one of the plausible ways of answering even the clearest, most carefully defined question about the world and human events. On the contrary, the history of science cautions us to be wary if we seem to be arriving at only one explanation to some problem. In such a situation, there is a good chance nature is only fooling us. Or perhaps more likely, we are only fooling ourselves.

Nothing we have discussed here should be taken to imply that scientists and philosophers of science are today in full agreement about how science works, about how scientists think, or about how science differs, say, from art, ethics, or religion. Nothing could be farther from the truth. And in a way, that is precisely the point. Science may not, and perhaps cannot, lead to absolute certainty or ultimate truth. The test of good science is instead whether you are traveling, *in the main,* on the right road, for science is how you travel, not a final destination. □

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ALASKAN

NATIVE CULTURE TOUR FOR MEMBERS

June 18-July 2

June 18: Fly from Chicago to Anchorage, transfer to Sheraton Anchorage Hotel. City tour, including Fine Arts Museum, then dinner at historic Club 25. Overnight Sheraton Anchorage Hotel.

June 19: Flight to Kotzebue, with day tour and overnight first class hotel.

June 20: Depart for Nome; day tour of Nome. Depart for Anchorage; overnight Sheraton Anchorage Hotel.

June 21: Depart early morning by motorcoach to Denali National Park (formerly McKinley). Afternoon and evening free for National Park Service slide shows and demonstrations, overnight first class hotel in park.

June 22: Early morning wildlife tour in park; early afternoon motorcoach to Fairbanks. Overnight Captain Bartlett Hotel.

June 23: Special tour and lecture for Field Museum by University of Alaska, on ivory and totem carving, agriculture, permafrost construction, oil development, economic situation, etc. Overnight Captain Bartlett Hotel.

June 24: Fly Fairbanks to Whitehorse. Yukon River raft trip and outdoor BBQ dinner. Overnight at Travelodge.

June 25: Day-long trip on narrow-guage railway to Skagway. Free time to sightsee, then to Klondike Hotel for overnight.

June 26: 5-hour boat curise to Juneau; to Baranof Hotel for overnight, with stop at Mendenhall Glacier enroute. Late afternoon walking and van tour, including historic district, gold mine, government buildings; outdoor salmon bake dinner. Overnight Baranof Hotel.

June 27: Morning tour of Alaska State Museum. Afternoon program on Alaska Native Land Claims Settlement Act and current native economic conditions. Board cruise ship *M.V. Statendam* in late afternoon. Meals on board begin with dinner. Cruise ship departs 11:00 p.m. (*Statendam* is 25,000-ton luxury liner.)

June 28: Day of cruising on Glacier Bay; lecture room provided to the group.

June 29: Port of call: Sitka. Special tour of Sheldon Jackson Museum, National Park Service exhibits, totem collection, Russian Orthodox church, Baranof Castle site.

June 30: Cruising off British Columbia coast.

July 1: Arrive in Vancouver by *Statendam* in morning. Special tour of Vancouver, highlighting Northwest Coast Indian art; overnight Bayshore Inn.

July 2: Fly from Vancouver to Chicago.

This tour is limited to 30 persons (double occupancy), and includes for the tour price of $3,700 (single supplement: $400) a lecturer and escort; all lodging, sightseeing, and transportation; best hotels available in each city; class D, E, and F outside cabins on the cruise ship; meals in the itinerary plus all breakfasts and all meals on the *Statendam*; all ground tours and transfers in exclusive vehicles and specially done for the Field Museum group with 30 participants. With 15-29 participants, tours will be done exclusively, but transfers may be combined with other travelers.

Our tour leader will be Dr. Margaret B. Blackman, associate professor of anthropology at SUNY-College at Brockport, New York, an authority on native cultures of the Northwest Coast and Alaska.

If you wish additional details for any tour or would like to be placed on a special mailing list, please call Dorothy Roder, Tours manager, at 322-8862, or write Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

This solid gold, 4½-lb. statue, acquired by Field Museum in 1922, is the single most spectacular find yet made in Philippine archaeology (according to H. Otley Beyer, who for decades has been the dean of archaeologists in the area). The Buddhist goddess was made ca. A.D. 1100-1300 and demonstrates an Asian influence on Philippine culture dating back to A.D. 1000 at the latest.

LEARNING MUSEUM CONTINUES WITH

PHILIPPINE EMERGENCE

By ANTHONY PFEIFFER, *Project Coordinator*
and BENNET BRONSON, *Associate Curator of Asiatic Archaeology and Ethnology*

Just southeast of China, forming a barrier between the South China Sea and the Pacific Ocean, seven thousand islands stretch in a chain a thousand miles long. The chain is anchored by large islands at either end: Luzon to the north and Mindanao to the south. Now known as the Republic of the Philippines, this archipelago holds a striking variety of cultures. They are at

once a tribute to the overwhelming force of colonial occupation and a testament to the fierce endurance of native traditions.

People first settled the archipelago hundreds of thousands of years ago when sea levels were low and one could walk between the Philippines and neighboring islands. Eventually the immigrants became sailors and farmers. Early Filipinos and their Malayo-Polynesian kin sailed to Africa and far into the Pacific. The farming peoples of the northern Philippines built colossal stone-walled terraces for their rice fields, terraces which became one of the wonders of the world. The peoples of the south were traders, warriors, artists, and weavers of some of the world's finest and least known textiles. There was artistic accomplishment in the central Philippines as well, but we know little about it. About 400 years ago most aspects of the original Central Filipino culture were altered so completely as to obliterate everything that had gone before.

The agents of this extraordinary change were a handful of overdressed foreigners who appeared as explorers in 1521 at the thriving port of Cebu, just north of Mindanao. They stayed for a few months, then left hurriedly after their leader, Ferdinand Magellan, was killed in a fight on a neighboring island. They left one object behind: a miniature statue of the child Jesus, a gift to the Cebu queen. She could not have imagined that this figure would come to be worshipped by 30 million Filipinos or that it would transform her land more completely than any other part of Asia.

Christianity came again to the central areas in 1565, borne not by explorers but by conquerors. By 1600 the soldiers and missionaries of Spain ruled half the Philippine land area and three quarters of its people. Shrines and idols were destroyed. The old leaders were Christianized and Hispanicized or replaced. Palaces for the new leaders sprang up, along with churches, monasteries, universities, and cities. The ancient arts disappeared as did much else, except for the local languages and certain foods and attitudes. The creativity of the Filipino people was inexorably channeled into Spanish ways.

Many Filipino traditions, such as reverence for the dead, thanksgiving after harvest, and fear of evil, were easily incorporated or reinterpreted in the light of Christianity. A heritage of craftsmanship was turned to new themes. Instead of *anitos*, or guardian figurines, for example, Filipinos began to make ornate statues of the Virgin Mary, some with realistic and delicately carved hands of ivory. Philippine-made ivory saints became the state of the art and were exported to churches in Spain and Mexico.

Mindanao chief (Bagobo tribe). The ornate textiles he wears are legacy of pre-Hispanic southern Philippines.

Only in the extreme north and south of the Philippines did the old ways survive. Warlike peoples — the "pagans" of the northern mountains and southern jungles and the Moros or Muslims of the coastal lands of eastern Mindanao and Sulu — fought the Spanish to a standstill. They were incessant raiders who sought slaves, loot, and — those who were headhunters — heads. They fought skillful defensive wars against Spanish pacifying expeditions.

The real stars of the resistance were the Moros, possessors of a brilliant artistic culture, talented weaponsmiths and shipbuilders, and masters of amphibious and trench warfare tactics. For more than three centuries they kept the Spanish at bay. In the early 1900s they fought fiercely against the Americans. They have continued to resist the government of the Philip-

Sultan's grandson poses in typical Moro style: with hand poised on sword. Standing boys are his servants.

pines since its independence from the United States in 1946. Few peoples in history have fought for their freedom so effectively and long.

The effect of centuries of Spanish occupation in cultural terms was to divide the Philippines into four parts: the unconverted areas of northern Luzon, the non-Muslim and non-Christian interior of Mindanao, the Muslim coastal areas of the southern islands, and the Catholic central part of the country. The last of these is the one that now dominates. More than ninety percent of Filipinos form part of the initially Hispanicized and then Americanized national culture, which most Americans (and Filipino-Americans) think of when they use the word "Filipino."

Yet the minority cultures are uniquely fascinating. They are a study in contrasts. The isolated Bilaan of Mindanao live in poor, plain shacks, but their clothing and textile arts are among the most splendid in Asia. Ifugao peoples of Luzon are exheadhunters, talented sculptors, and — with their great rice terraces built of stone — landscape architects on a truly titanic scale. For centuries the Moro Tausug of Sulu in the far south withstood the war fleets of the Spanish Empire in cannon-armed canoes. Although seeming like backward savages, the Hanunoo of Mindoro know agriculture as well as any Illinois farmer; their own alphabet, developed in prehistoric times, was used not for record-keeping but for writing poetry.

These minority cultures are important because they closely represent what all of the Philippines was like before the Spanish came. To Filipino-Americans, almost all of whom come from majority culture backgrounds, the "other" Philippines provide a key to their heritage. Is the Philippines just an extension of the West, mysteriously transplanted on Southeast Asian soil? Or are the Spanish-style food, the fine American-style education system, and fervent Catholic faith just thin veneers on an essentially Asian land? Such questions can be answered only by studying non-Westernized minorities and pre-Spanish history.

Philippine Emergence affords the opportunity to explore Philippine roots from their deepest prehistoric origins to their most recent

THE LEARNING MUSEUM AT FIELD MUSEUM

The Learning Museum Program began at Field Museum in 1979 with a grant from the National Endowment for the Humanities (NEH), a federal agency. The NEH grant allowed the Museum to present a three-year sequence of learning opportunities focused on its outstanding exhibits and collections. Courses were designed to give participants an opportunity to explore a subject in depth. Field Museum is pleased to announce that the Learning Museum program continues as a featured offering in Course for Adults *brochures. The program emphasizes special Museum activities and strengths as it did under NEH funding.*

Entire mountains such as those seen here were spectacularly transformed into rice terraces by the farmers of the Cordillera Central, Luzon.

controversial moments. The lecture course considers the pre-Spanish phase of Philippine history, the Spanish period, the living or recently vanished minority cultures of the far North and South, and the role of the Philippines in world affairs today. Philippine Emergence is offered in conjunction with "The Art and People of the Philippines," an exhibition opening at Field Museum on July 17. Details of the course are announced in the summer 1982 *Courses for Adults* brochure.

Watch also for the announcement of Filipino Afternoon in the July/August *Calendar of Events*. You are invited to celebrate the traditions of the Philippines. Dances from the Philippines, presented by Lakambini of the Urban Gateways Folk Arts Program, are among the day's featured activities. Lakambini is a troupe of young artists who are dedicated to their Filipino cultural heritage. Their dances reflect the Indo-Malaysian, Muslim, and Spanish influences found throughout the islands. Lakambini dances to the Kulintang orchestra, traditional music made on a set of graduated gongs. A narrator provides background information on the culture and arts of the Philippines and Filipino-Americans. Filipino Afternoon is held on Sunday, July 18 from 1 to 4 p.m. and is free with Museum admission. □

Moro sailboat of the type often used in raids against the Spanish and for piratical expeditions.

PUPPETS EXTRAORDINAIRE:

Théâtre Sans Fil

(The No Strings Puppet Theatre)

James Simpson Theatre
June 26, 27
2:00 p.m.
Members: $3.00; Nonmembers: $4.00

This unique theatre medium of gigantic puppets (6 to 12 feet tall) makes its first appearance at Field Museum on June 26 and 27 with two American Indian legends, "Blue Sky Takes a Wife" and "The White Raven." The entire fascinating production is entitled "Tales from the Smokehouse."

Adults and children alike marvel at the striking visual and musical effects employed in the enactment of these ancient tales, in which more than 40 enormous puppets appear. Reviewers have termed the production "an absolutely elegant puppet show that brings a mythic experience to life in rapturous detail." The program, a Learning Museum event, is made possible by a grant from the National Endowment for the Humanities.

The only Canadian company to work with giant puppets, the Théâtre Sans Fil has developed new techniques for their fabrication and manipulation. The Théâtre Sans Fils was founded in 1971 and now has nine productions to its credit. The company's reputation has grown steadily over the years and it was chosen to represent Canada at the International Puppet Festival in Washington, D.C. in 1980.

For ticket information, please call (312) 322-8854. Tickets will also be available at the West Door box office one hour before curtain time.

Field Museum Tours for Members

Australia Tour

August 23-September 12
Tour Price: $4,998 (double occupancy)

Leader of this extraordinary tour is Dr. Alan Solem, curator and head, Division of Invertebrates, who has made nine trips to Australia in connection with his study of land snails. The tour will feature the glory of the Western Australia spring, the greatest display of wildflowers in the world, the charm of an English countryside in South Australian vineyards, a face-to-face meeting with eastern Australian wildlife in Victoria, and the awesome expanses and spectacular mountains of central Australia.

The tour will arrive in Sydney on August 25, then take a 75-minute flight to Melbourne. The two days in Melbourne will include visits to a local wildlife sanctuary as well as to various sites of cultural interest.

A 40-minute flight on August 27 will take the group to Adelaide, followed by visits to local vineyards. A 90-minute flight that evening will terminate at Alice Springs, the group's base of operations for six days. Highlights here include sight-seeing into the outback, bush barbecues, and a visit to spectacular Ayers Rock.

September 3 will be spent in and around Perth. Rides by hydrofoil and river boat will be optional. September 4 will be spent traveling by motorcoach to Augusta while viewing some of Australia's most delightful scenery.

September 5: A trip to Walpole-Normalup National Park, seeing 200-foot-high stands of red tingle trees, September 6: Colorful Albany, an old whaling port. September 7: A day trip to the Porongorup and Stirling mountain ranges.

September 8: Return to Perth via the Albany Highway, with views of the Darling Range. September 9: Perth, with time for shopping and sight-seeing. September 10: In Sydney for a day of leisure for shopping, sightseeing, or day tours.

September 11: Depart from Sydney for U.S. Having lost a day by crossing the International Date Line, we overnight at San Francisco's Sheraton Airport Hotel.

September 12: Arrival in Chicago.

For additional information on this tour, please write or call Dorothy Roder, Tours Manager, at Field Museum, 322-8862.

Some Responses to Early Contact on the Pacific Northwest Coast

by MARLENE MUSSELL

Most early documentation of European contact with the Northwest Coast peoples amply records the reactions of the explorers, their arrogance, curiosity, fear, amusement, and admiration; but such reports largely fail to recount the natives' response to such contacts. By using European documentation as well as native oral traditions, we may arrive at an enlightening and sometimes amusing view of two cultures trying to understand and categorize one another. This may also yield a more balanced viewpoint, and a clearer picture of the groups' mutual reaction emerges.

The discoveries of these early explorers validated the existence of what Europeans had termed the "New World," although the populations of this continent had emigrated here from Siberia some 20,000 to 40,000 years earlier. A tradition which was to evolve into the historic Northwest Coast culture had emerged by at least 1,000 B.C., and by 500 B.C. there is evidence of an antecedent Northwest Coast art style. Thus, a complex and highly evolved society was on hand to witness its own discovery by Europeans in 1741.

Captain James Cook's ships in Nootka Sound, B.C. Drawing by John Webber (1778), expedition artist.

The first contact occurred in that year between Vitus Bering, a Dane in the employ of the Russians, and the Tlingit, near Cross Sound, Alaska. This meeting was followed three years later by that of the Spaniard Juan Josef Perez Hernandez, who encountered a Haida group on Graham Island, B.C. In 1778 Captain James Cook, of England, made contact with the Nootkan of Nootka Sound, B.C., and in 1786, the French admiral La Perouse traded with the Tlingit in Lituya Bay, B.C. Other expeditions also occurred during this period, but these four highlight the internationalism of the discovery of the Northwest Coast, involving as it did Russian, Spanish, English, and French explorers.

In their accounts, many of the explorers tended to emphasize only what they felt was the Indians' awe and fear upon first seeing the white man and his great ships. While these reactions were most natural, such descriptions seem to contradict the explorers' reports of the Indians' occasional aggressiveness, and their willingness not only to approach the European ships, but to climb aboard and barter for trinkets and pieces of iron. European reports also often failed to acknowledge the Indians' contributions to the discoveries of the European. By using Indian oral traditions, another view of such discoveries emerges. Thus, Captain Cook's "discovery" of Vancouver Island is given a less familiar and perhaps more down-to-earth approach in this contemporary Nootkan oral account: "They were led into a shelter, these ships. They got stuck. They were anchored out in the open Pacific and a bunch of Indian people...

Marlene Mussell is a volunteer for the project "Maritime Peoples of the Arctic and the Northwest Coast."

directed these ships that couldn't get in, 'cause they didn't know, and they were told to come around that point."[1]

A more balanced and probably more realistic report of early encounters concerns the first meeting between the Tlingit and members of the 1789 Malaspina expedition: "The first view, when they were near was one of great astonishment, both for the Indians and for us; for the Indians because they did not cease looking at the ships,... for us because such strange and marvelous subjects presented themselves to our sight".[2] Each side captured these early meetings through their art; the Europeans by painting scenes of their ships "on location," and the Indians by carving petroglyphs.

Both groups tended to focus on aspects of the other's culture and appearance to which they could relate in terms of their own backgrounds. One of Cook's men, for example, compared the Nootkan to the Scottish in appearance.[3] William Beresford, a member of Captain George Dixon's 1789 expedition, described a woman whose "countenance had all the cheerful glow of an English milkmaid;... she was what could be reckoned handsome even in England."[4] The Indians seemed hard put to classify the Europeans, but the visitors' strange appearance was soon explained in cultural terms.

To the Tlingit, the members of La Perouse's expedition looked like small black birds rising in the body of a great black raven. As the Tlingits' creator, Yehlh, often assumed the form of a raven, they thought that Yehlh had now returned to earth in this guise. As the sails were folded and the sailors climbed the rigging, it appeared to the Tlingit as if great birds were folding their wings, and from them, flocks of small black messengers were rising and flying about.[5] The Nootkan reasoned that since the Europeans lived on a floating thing—the ship—then the visitors must be fish, a notion confirmed by the appearance of two expedition members in particular: a man with a large hooked nose who was surely a dog salmon, and a hunchback who must have been the humpback salmon transformed. Even today a Nootkan word for "Europeans" is *mamal'ni:* literally, "people who live on the water and float around, having no land."[6]

Finally satisfied that these strangers were indeed human, the Indians were willing to trade; but before this could get under way, a welcoming ceremony was performed from the canoes. In 1778, James King, lieutenant on Cook's ship, the *Resolution*, describes such a welcoming ceremony: "the figure and actions of one of these (Indians) were truly frightful, he worked himself into the highest frenzy, uttering something

Petroglyph on Wedding Rocks, Cape Alava, B.C., showing explorers' ships.

between a howl and a song,...this was followed by a violent way of talking, seemingly with vast difficulty in uttering the Harshest and rudest words." King concludes however: "yet we did not attribute this incantation to threatening or any ill will towards us; on the contrary they seem'd quite pleased with us..."[7] La Perouse similarly describes such a reception, concluding that these songs were by no means disagreeable, "greatly resembling the plain chaunt of our churches."[8] David Samwell, surgeon's first mate on the *Resolution*, also writes about the Indians' singing in terms easily accessible to an Englishman of those times: "they all sung in concert in a wild Manner, which some of our sailors compared to that of a Brother Tar on board who it seems in his time had cryed Potatoes about London."[9]

Most of the early discoverers noted how much Northwest Coast Indians enjoyed singing, and Samwell described what must have been an interesting cultural exchange between two groups who finally found a medium that they could enjoy and share together. After a Nootkan "sang in concert in no disagreeable Stile," the ship's crew reciprocated, giving "them in return a few tunes on two french Horns after their song was ended, to these they were very attentive, not a word to be heard among them during the time of playing; this situation was returned by another Song from the Indians, after which we gave them a Tune on the Drum and Fife to which they paid the same attention as they had done to the Horns. These Canoes staid by the Ship most of the Night seemingly with no other View but that of gratifying their Curiosity."[10] It is interesting here to note the Indians' attentiveness; for they observed the Europeans' performance with a cultural curiosity similar to that of the many explorers. The so-called observers had become the observed.

Man of Nootka Sound. Portrait by John Webber, 1778.

At times, both groups obviously regarded the other with a certain contempt, possibly because each felt superior. The Indians' contempt found expression in stealing whatever they could lay their hands on. De Laguna writes that the Tlingit seized what they desired only from inferiors.[11] Because the Europeans also often failed to reciprocate courtesies, especially with respect to the chiefs, the natives may have decided that the visitors were fair game for cheating and theft. This sense of their own superiority is underscored by the fact that when caught stealing, the natives behaved as though it were just a joke. Samwell records that when a native was apprehended stealing Captain Cook's watch, he "gave it up quietly and laughed in his (captor's) face."[12] Samwell also notes that "they considered it as a piece of Dexterity (even sport) that did them credit ra(ther) than any dishonour."[13] La Perouse, for one, angrily denounced these "deceitful and malicious savages" who took every opportunity to rob whenever no one was looking.[14]

While the early explorers have left us thorough accounts of the natives' exotic apparel, utensils, and material culture in general, we have little information on how the Indians viewed or responded to the material culture of the Europeans. In part, this is because members of nonliterate societies are dependent on their oral tradition as the medium for documenting historical events and their own responses to them. The importance of this oral tradition as an historical resource has not always been fully realized, though it has been shown that native history can be passed down orally, through generations, with minimal modification of factual content. Such an oral tradition among the Northwest Coast peoples records their attempts to come to terms with and understand European goods.

House interior, Nootka Sound. Drawing by John Webber, 1778.

While Europeans puzzled over the meaning of the potlatch gift-giving ceremony, carved totem poles, masks, and other items, the Indians tried to cope with such everyday European goods as pilot biscuits, syrup, and hatchets. One Nootkan recounts that, bewildered by gifts of pilot biscuits, the Indians simply stored them away as good luck charms. Another relates how the biscuits were regarded as lovely pieces of wood to be kept as souvenirs. A European hatchet was worn by a chief as a necklace; instead of being eaten, syrup was tried as a crack sealant for canoes in the way that Indians normally used hot seal oil.[15]

Again we see the natives attempting to categorize a cultural curiosity so they could more readily comprehend it. Lieutenant King wrote —and his words could refer just as easily to the native response to the European: "It will require the assistance of ones imagination to have an adequate Idea of the ...Actions of these first Visitors."[16] One should add that the use of both oral and written traditions is also required.□

Notes

1. Efrat, Barbara and W.J. Langlois, "The Contact Period as Recorded by Indian Oral Tradition" in *Nutka. Captain Cook and The Spanish Explorers on the Coast. Sound Heritage*, Vol. VII, No. 1: 54-62, 1978. p.55

2. De Laguna, Frederica. *Under Mount Saint Elias: The History and Culture of the Yakutat Tlingit, Part I and II.* Smithsonian Institution Press, Washington D.C. 1972. Part I., p.141.

3. Beaglehole, J.C. *The Journals of Captain James Cook on his Voyages of Discovery: The Voyage of the Resolution and Discovery 1776-1780*, Vol. III, Part I and II. Cambridge published for the Hakluyt Society at the University Press, 1967. Part I, p.311.

4. Dixon, Captain George. *A Voyage Round The World; but more particularly to the North-West Coast of America: performed in 1785, 1786, 1787 and 1788.* George Goulding, London, 1789. p.171.

5. Emmons, G.T. "Native Accounts of the meeting between La Perouse and the Tlingit," *American Anthropology.* Vol. 13: 294-298, 1911. p.297.

6. Sound Heritage. Ibid., p.60.

7. Beaglehole, Ibid., part II., p.1,394.

8. La Perouse, Jean Francoise de Gallup, Comte de. *A Voyage round the World, performed in the years 1785, 1786, 1787 and 1788.* Vol. I. A. Hamilton, London, 1799. p. 370.

9. Beaglehole, Ibid., p. 1,088.

10. Ibid.

11. De Laguna, Ibid., Part II., p.355.

12. Beaglehole, Ibid., p.1,096.

13. Ibid., p.1,100.

14. La Perouse, p.398.

15. Sound Heritage, p.58.

16. Beaglehole, p.1,392.

FIELD MUSEUM STORE

GALLERY NINE

Museum Members and the general public are invited to a new exhibition selling of the finest art works by top artists and craftsmen of the Arctic and Pacific Northwest. The gallery opening coincides with the opening of Hall 10.

Artists represented include:

Primrose Adams
Larry Avakana
Steve Brown
Joe David
Robert Davidson
Dorothy Grant
Calvin Hunt
Henry Hunt
Tony Hunt
Tony Hunt, Jr.
Nathan Jackson
John Livingston
Melvin Olanna
Duane Pasco
Katie Pasco
Selina Peratrovich
Bill Reid
Cheryl Samuel
Jim Schoppert
Joe Senengetuck
Ron Senengetuck
Norman Tait
Art Thompson

All from British Columbia, Alaska, and Washington, their works here assembled present a stunning array of talent never before seen in Chicago. Included are wood carvings, masks, jewelry, totems, baskets, weavings, serigraphs, and button blankets.

Gallery Nine Hours: 11-5 or by special appointment.

Museum Store Remodeled

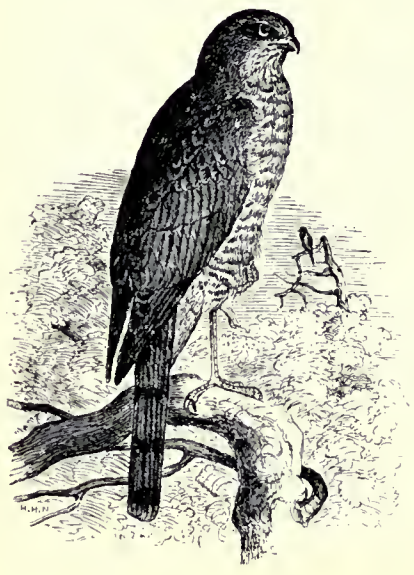
The Museum Store, newly remodeled, is again open. A new section, featuring choice items related to special exhibitions, currently features a wide variety of merchandise from the Arctic and the Pacific Northwest or related to the cultures of those regions.

Ten Years Later: Bird Populations Rise as DDT Falls

Ten years after the official ban on the use of DDT, the news from the wild is good: Bald eagles, brown pelicans, and other bird species once decimated by the pesticide are repopulating former habitats as chemical residues fade.

The pesticide was banned in 1972 in the face of scientific evidence that it was causing serious environmental problems, including reproductive failure in susceptible bird species. For the past decade, human efforts have combined with natural forces to restore species that experienced sudden, sharp declines in the 1950s and 1960s. While specialists have teamed up to put intensive recovery programs into action, U.S. Fish and Wildlife Service researchers have completed studies that have proven DDE, a breakdown product of DDT, to be specifically responsible for eggshell thinning—the main reason some birds could no longer reproduce. Service scientists also learned which species were sensitive to the pesticide, as well as which ones suffered the heaviest exposures.

Scientists at the service's Patuxent Wildlife Research Center near Washington, D.C. began to study the impact of DDT on wildlife shortly after World War II. In their investigations, service scientists compared field observation with specialized laboratory research on surrogate species. They verified that sensitive species most seriously affected by DDT build-ups were those which preyed on fish and other small animals that had been exposed to DDT. Scientists learned that the higher a species and its food source were on the "food chain," the more severe the impact.



The bald eagle was highly vulnerable since it fed heavily on fish in which DDT residues had accumulated. By the late 1960s breeding populations had been practically lost in the Great Lakes region and on the East Coast, with just one known breeding pair each in New Jersey and New York State. Recently, however, bald eagles have returned to nest in formerly contaminated wetlands. Florida's population, which dropped 90 percent in the 1950s has made a complete comeback, and the eagle's return to such regions as the Great Lakes may signal a turning point for America's national symbol.

The peregrine falcon—an efficient hunter which can strike its prey at 200 mph in mid-air—occupies a position in the food chain similar to that of the bald eagle and suffered a similar decline. By the late 1960s there were no peregrines known to nest east of the Mississippi River, where several hundred pairs had existed formerly. Since there were no birds left to repopulate former habitats, the falcon's recovery has been aided in the last decade by re-introduction of captive-reared birds to promising areas, including cities where prey such as starlings and pigeons abounds.

While bald eagles and peregrine falcons were contaminated by DDT through high concentrations in their diets, research has shown that they are less than half as sensitive to the pesticide as the endangered brown pelican. Most pelican populations on the Atlantic and Gulf coasts were hard hit in the 1960s. In South Carolina, for instance, there were about 6,000 breeding pairs before DDT washed into Atlantic estuaries. In 1969—a low point for pelicans and other contaminated species—only 1,100 to 1,200 pairs were left and reproduction was nil. Now the pelicans number some 5,000 pairs, their rapid comeback mostly due to their principal food source, the menhaden fish, not having retained much DDT residue. Service scientists say that while pelican populations are not yet completely restored, their reproductive rate in most of the U.S. has returned to near normal.

The osprey (fish hawk) also staged a rapid comeback after being nearly eradicated in parts of the East. From New York to Boston the osprey population fell from 1,000 to 100 breeding pairs in the 1960s. But the species has been on the rise since the mid-1970s, with normal reproduction. Biologists hope ospreys will reach their pre-DDT population level by the end of the century.

Scientists have not completely answered why species with similar habitats vary in their sensitivity to DDT. The black duck, for instance, is more sensitive to DDT than the mallard. Terns and skimmers that shared coastal habitats and fish diets with pelicans apparently were not affected by the pesticide. Herring gulls consumed heavy amounts with little adverse reaction.

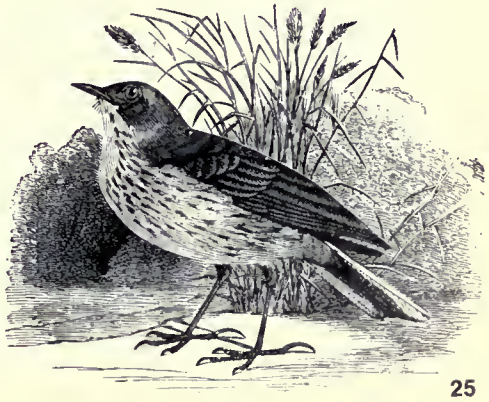
Although DDT has been banned in the U.S. for a decade and residues in most areas are slowly fading, some bird populations are still affected. In Los Angeles, for instance, high residues in sediments that are taking years to break down continue to contaminate pelicans. Also, some Western migratory bird populations, including peregrine falcons and black-crowned night herons, are absorbing DDT in Latin American countries where the pesticide is still used.

The service's research with DDT and other chemicals has demonstrated that different species react very differently to each compound and industrial chemical. For example, evidence thus far indicates that polychlorinated biphenyls (PCB's) have little if any effect on reproduction in some wild birds at levels normally found in today's environment. In contrast, some mammals are sensitive to minute amounts of PCB's in their habitats.

California Condor Pair Lays and Loses Egg

Condor Research Center biologists have become the first persons ever to witness the laying of a California condor egg and its loss 12 days later over a cliff edge during a complicated series of disputes between the pair members.

Remarkably, the female laid her egg from a standing position. It fell from a height of nearly a foot to the floor of a cliff cave, apparently without suffering any damage. Whether such egg laying is typical for the species is not known. →



According to Noel Snyder, the U.S. Fish and Wildlife Service team leader at the Condor Research Center in Ventura, the biologist observed the event through a telescope at a distance of one-third of a mile in a mountainous region northwest of Los Angeles. The egg was laid at exactly 2:06 p.m., February 14; the female began incubating the egg just six minutes later.

Incubation proceeded smoothly, with both birds taking several-day turns sitting on the egg until February 24, when the female returned from foraging and her mate refused to let her take over the incubation. She attempted to get to the egg for two days, only to be repeatedly rebuffed by the male. Finally, on February 26, she managed to work the egg out from under her mate, but it rolled out of the nest cave onto a ledge in the process. The birds attempted to roll the egg back into the cave but were unable to get it up the incline. Ultimately, the egg rolled off the cliff during further disputes over which bird would sit on it.

Only about 30 California condors remain in the wild, all in southern California. "With so few birds left," Snyder said, "the success of every nesting attempt is important and every loss is a great disappointment." He added that there is still a "reasonably good chance" the pair may lay a second egg, since they lost the first one so early in the breeding season. In fact, the pair was seen courting and checking nestholes again within two days of losing the egg. Normally, California condors lay only one egg every two years, but they have been known to re-lay within a year if they lose an egg early.

The condor pair is believed to be the same pair that successfully fledged a chick two years ago from a nest cave close to the one used this year. There were arguments between the pair in 1980 as well, according to Snyder, but the disputes did not develop so early and caused no apparent harm to the breeding effort.

Only four other active pairs of condors have been located by the research team. One of these produced a fledgling last year and is not expected to breed this year as they are still caring for this youngster. None of the other three pairs has laid as yet, with two months to go in the egg-laying season. The research team is keeping track of all these pairs from a safe distance.

Field Museum Tours for Members

For tour information, please write or call the Tours Office, 322-8862

Jewellike Devil's Lake

Wisconsin's Baraboo Range

May 22-23
$125.00

DR. EDWARD OLSEN, curator of mineralogy, will lead tour members through the Baraboo Range and along the shores and hinterland of beautiful Devil's Lake, 150 miles northwest of Chicago. The Baraboo Range is of special interest as a *monadnock*—what is left of an ancient mountain range and which now stands out above the younger rocks and sediments. The range consists of quartzite—more than one billion years old—which, although compressed in places into vertical folds, retains the original sedimentary structures. The mountains were further modified by glaciers, forming the lake and the picturesque glens, and changing the course of rivers.

Overnight accommodations and meals will be at a nearby motel. Hiking clothes are strongly recommended for the scheduled hikes. The trip is not suitable for children, but younger people interested in natural history are welcome. For further details please call or write the Tours office.

Kenya

with optional extension to the Seychelles
September 11-October 1
price to be announced

THERE IS NOW as there always has been, an aura or mystery surrounding Africa—Tropical islands and the coast, endless palm-fringed beaches, snow-capped mountains on the equator, jungle primeval, sun-baked plains. They are all a part of East Africa. The wildlife...the stately processions of elephant and giraffe, prides of lion, the beautiful and rare leopard, the elegant cheetah, the magnificent migration of the wildebeest and zebra. Only here in East Africa is there still such diversity.

The itinerary includes a daytime stopover in London, overnights at the Nairobi Hilton, Mt. Lodge Tree Hotel, Samburu Game Lodge, Mount Kenya Safari Club, Lake Hotel (at Lake Naivasha), Governor's Camp (Masai Mara Game Reserve), and other first class accommodations. An overnight stay in London will conclude the trip. A three-day extension to the Seychelles Islands is available as an option.

Tour lecturer will be Audrey Faden, a native Kenyan, who formerly served as Officer in Charge of Education at the National Museum of Kenya, Nairobi.

Beach scene, Seychelles

May & June at Field Museum

May 16 through June 15

New Exhibits

"Maritime Peoples of the Arctic and Northwest Coast." Hall 10. This dramatic new, permanent exhibit opened April 24. It is an innovative exhibit which compares and contrasts the theatrically ornate cultures from the North Pacific Coast with the austere but individualistic Eskimo societies. Situated along the coasts of the Northern Pacific and Arctic oceans, these two distinct cultures have adapted to differing environments by using similar techniques to harvest the riches of the rivers and oceans.

Enter the Introductory Gallery (I) from Hall 3 on the northeast corner of Stanley Field Hall. Here the lush forested Northern Pacific area is compared to the barren tundra of the Arctic. The Northwest Coast Indians and the Eskimos both lived by hunting and fishing; they never depended on agriculture. How they hunted, fished, and gathered from the land and sea is explained in Gallery II. Full-sized house replicas of each group are featured in the Village and Society Gallery (III). The Spiritual World Gallery (IV) defines the interrelationships of the human, animal, and Spiritual world. In the final Gallery (V) the stunning art of the Northwest Coast Natives and Eskimos is dramatically presented. The towering totem poles and tiny scrimshawlike engravings exemplify the rich artistic heritage of these groups.

Here is an exhibit you'll enjoy at a leisurely pace, but will want to return to again and again.

- Gallery Nine. Special exhibit area in Hall 9. An art gallery for viewing and purchasing. One may select from the work of more than 20 of the finest contemporary Northwest Coast and Eskimo artists. From April 24 to May 25.
- Museum Store. Look for the newly remodeled Museum gift and book shop facilities when visiting the Maritime Peoples exhibit.
- Totem Pole. Field Museum's first outdoor artifact, a 55-foot totem pole was raised to herald the April 24 opening of "Maritime Peoples of the Arctic and Northwest Coast."

"Maritime Peoples of the Arctic and Northwest Coast" Special Programs

Northwest Coast Lecture Series. "Strategies of Society: Social Organization." The second lecture series concentrates on the social structures of Northwest Coast tribes and how their art is integrated into those societies. You may attend the whole series or any individual lecture. Each lecture is given by a leading authority on native cultures of the Northwest. Entrance for these 8 p.m. lectures is through the West door. The series is $9 for Members and $12 for nonmembers. Single lecture is $3; $4 for nonmembers.

- ☐ May 14 "Kwakiutl Winter Ceremonies," by Peter Macnair, curator of anthropology, British Columbia Provincial Museum, Victoria, British Columbia.
- ☐ May 21 "Tlingit Property Law," by Rosita Worl, Department of Anthropology, University of Alaska, Anchorage, Alaska.
- ☐ May 28 "Heraldic Symbolism," by Joan Vastokas, Department of Anthropology, Trent University, Petersborough, Ontario.
- ☐ June 4 "Historical Perspectives: Form and Tradition in Regional Art," by Bill Holm, curator of Northwest Coast art, Burke Museum, University of Washington, Seattle, Washington.

The Gie Sun Dancers. Tlingit Indians from Juneau, Alaska, will perform in Stanley Field Hall. Each Tlingit dance and its song is considered a family property to be performed on public occasions with the proper costumes and carvings. May 22 and 23 at 1 and 3 p.m.

Craft Demonstrations. The Tlingit and Haida craftspeople, who are active in the revitalization of Northwest Coast art forms, demonstrate their skills. They use such regional materials as wood, bone, argillite (a slate-like stone), grasses, and wool. The three renowned Haida basket weavers who will show basketry techniques are: Primrose Adams, Selina Peratrovich and Delores Churchill. May 22 and 23 at 11 a.m. and 2 p.m.

Northwest Coast Film Series: "People of the Tide and Tundra." A film series for deepening museumgoers' appreciation of the new permanent exhibit, "Maritime Peoples of the Arctic and Northwest Coast." Free with Museum admission. Saturdays

Continued on back cover

EDITH FLEMING
946 PLEASANT
OAK PARK ILL 60302

May & June at Field Museum

Continued from inside back cover

and Sundays in May, 1:30 p.m. in Lecture Hall I.

May 15, 16 *Eskimo Artist: Kenojuak.* The life and work of an Eskimo woman artist. *The Legend of the Magic Knives.* A Kwakiutl legend is told through totem pole carvings.

May 22, 23 *Wooden Box Made by Steaming and Bending.* The traditional methods of making cedar boxes is shown. *Nathan Jackson: Tlingit Artist.* A contemporary artist shares his insight into the nature of Tlingit art.

May 29, 30 *People of the Seal: Eskimo Summer.* The summertime activities of Netsilik Eskimos is portrayed. *The Crooked Beak of Heaven.* A potlatch and other traditional ceremonies of Northwest Coast Indians are documented.

New Programs

KITES ON THE WING. A Weekend Family Program. Make your own kite in the shape of a bird and fly it (weather permitting). Members of the Chicagoland Skyliners, a kite-flying club, will be on hand to assist. Compare the behavior and habitats of different birds and view the special display of kites. Bring your own #20 brown paper bag and at least 50 feet of kite string. May 16 from 1 to 3 p.m.

INTERNATIONAL MUSEUM DAY screening of the film "Museum" offers an inside look at how a museum functions and who the people are who work in them. May 16 at 1 p.m. and at 3 p.m. Free with Museum admission.

GAMELAN CONCERT. The Gamelan Repertoire Ensemble, now in its fifth year of performing, and the three-year-old Gamelan Performance Ensemble will both play during this concert in James Simpson Theatre. June 13 at 2 p.m.

WEEKEND DISCOVERY PROGRAMS. Tours, craft projects, slide presentations, and films which use Field Museum exhibits as a springboard for new insights into natural history projects are featured on Saturdays and Sundays. Check *Weekend Sheet* available at Museum entrances for added programs.

May 15, 3 p.m.	"Life in Ancient Egypt," tour.
May 16, 1:30 p.m.	"Tutankhamun: Discovery and Treasures of the Tomb," slide program.
May 23, 1:30 p.m.	"Tibetan Life and Religion," slide program.
May 29, 2 p.m.	"Chinese Ceramic Traditions," tour.
June 5, 1:30 p.m.	"Malvina Hoffman," slide program.
June 6, 1:30 p.m.	"Egypt in 1923: A Nile Journey," film.
June 12, 1 p.m.	"Tibet Today," slide program.
June 12, 2 p.m.	"Tibet," film.

THE NATURE CONSERVANCY is a national conservation organization committed to preserving natural diversity by protecting lands with the best examples of all components of our natural world. Slide lecture presents examples of preserves retained by the Conservancy and managed by volunteer land stewards. June 5 at 2 p.m.

Continuing Programs

VOLUNTEER OPPORTUNITIES. Individuals with scientific interests and backgrounds are needed to work in various Museum departments. Contact the Volunteer Coordinator, 922-9410, ext. 360.

MAY AND JUNE HOURS. The Museum is open daily 9 a.m. to 6 p.m. except Fridays. On Fridays, the Museum is open from 9 a.m. to 9 p.m. throughout the year.

THE MUSEUM LIBRARY is open weekdays 9 a.m. to 4 p.m. Closed Memorial Day, May 31. Obtain a pass at the reception desk, main floor.

MUSEUM TELEPHONE: (312) 922-9410

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

June 1982

Field Museum of Natural History Bulletin

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FRONT COVER

Detail of Big Beaver totem pole, installed in front of Field Museum April 24, 1982. Shown here is head of grandson of Beaver Chief; he holds beaver tail. Photo by Tom Hocker.

BACK COVER

Detail of Big Beaver totem pole: head of Beaver Chief. Photo by Ron Testa.

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Big Beaver Comes to Field Museum

April 24, 1982, is a day to remember in the history of Field Museum and of the City of Chicago. For on that sunny, windswept Saturday, the Big Beaver totem pole, the 55-foot creation of Norman Tait, was raised and dedicated in front of the Museum—the first artifact to be on permanent exhibit *outside* the Museum in its 89-year history.

For the City of Chicago, the pole was now to be counted among the city's great outdoor works of art, taking its rightful place among a Picasso, a Miró, a Calder, an Oldenburg, and a Chagall, among others.

The pole was carved in Vancouver, B.C., by Nishga artist Norman Tait, of the Tsimshian group of Northwest Coast Indians. Tait was commissioned by the Museum to carve the pole for the celebration of the opening of the new permanent exhibit, "Maritime Peoples of the Arctic and Northwest Coast," in Hall 10.

Tait began his task by going into the forest to select the perfect tree. With the help of the British Columbia Council of Forest Industries, a 65-foot cedar tree was cut and transported to the warehouse, where he and his apprentices set to work. They began their carving after Tait retold the Beaver Legend to the group of workers.

It is the story of how a family of Indians (Tait's ancestors) came to learn of the beaver's ways and adopted the beaver figure as its clan symbol. To the Northwest Coast Indian carver, the pole is the medium for the telling of an age-old story—one held dear to the family of the carver and only allowed to be told by that family.

When totem poles were first observed by European explorers they were thought to be objects of worship. Further contact revealed that the poles were simply a way to publicly tell a story and at the same time bring honor and status to the owner of the pole. In the complex societies of the Northwest Coast, honor and status were as important as material wealth.

Free-standing poles, like the one Tait has carved

Big Beaver totem pole, detail of human face. Photo by Tom Hocker.

Opposite: Detail of pole showing figures of four brothers who adopted the Big Beaver story. Photo by Tom Hocker.

for Field Museum, are outgrowths of carved house-posts or support beams used inside Indian houses. Woodcarvers without peer in the Americas, the Northwest Coast Indians decorated these large wooden beams with intricate designs, using a unique tool, the hand adze, with precision and delicacy.

The pole was raised at its lakefront setting in the traditional manner, using six ropes to pull it upright. Thousands assembled for the pole raising ceremony and over 200 actually assisted in raising it. Among those present was Her Honor Jane Byrne, mayor of the City of Chicago.

Before the pole-raising, carver Norman Tait delivered a brief address:

To the people of Chicago, and especially to Her Honor Mayor Byrne, I would like to welcome you to witness the birth of the Big Beaver. It has been in labor pains for the last six months. Where we take nine months, the totem pole takes six months, so I would like to invite the people of Chicago to come forward and help with the umbilical cord of this great person, the Big Beaver. I'd like you to also witness the first time that the family of Rufus Watts will have danced and raised the pole at the same time in about 80 years. This group is very new as compared to the very rich peoples of the Northwest Coast. I would like to thank you all for coming. Thank you.

Top: Big Beaver arrives in Chicago April 9 via C P Rail/Soo Line at Edward Hines Lumber Company. Middle: In front of Field Museum on April 22; Museum staff members shift the pole so that carvers may complete final details. Bottom: April 23—staff members carry the pole into final position before raising. Photos by Ron Testa.

The Big Beaver Legend

The "Big Beaver" pole which Norman Tait carved for Field Museum depicts the figures involved in the Beaver legend and part of his family's history. The story was told to him by his maternal grandfather, Rufus Watts, and has been passed on from generation to generation. It describes the adoption of Beaver songs, dances, and images by the Eagle tribe; it is part of the Nishga heritage and is seen as the truth by the Nishga people.

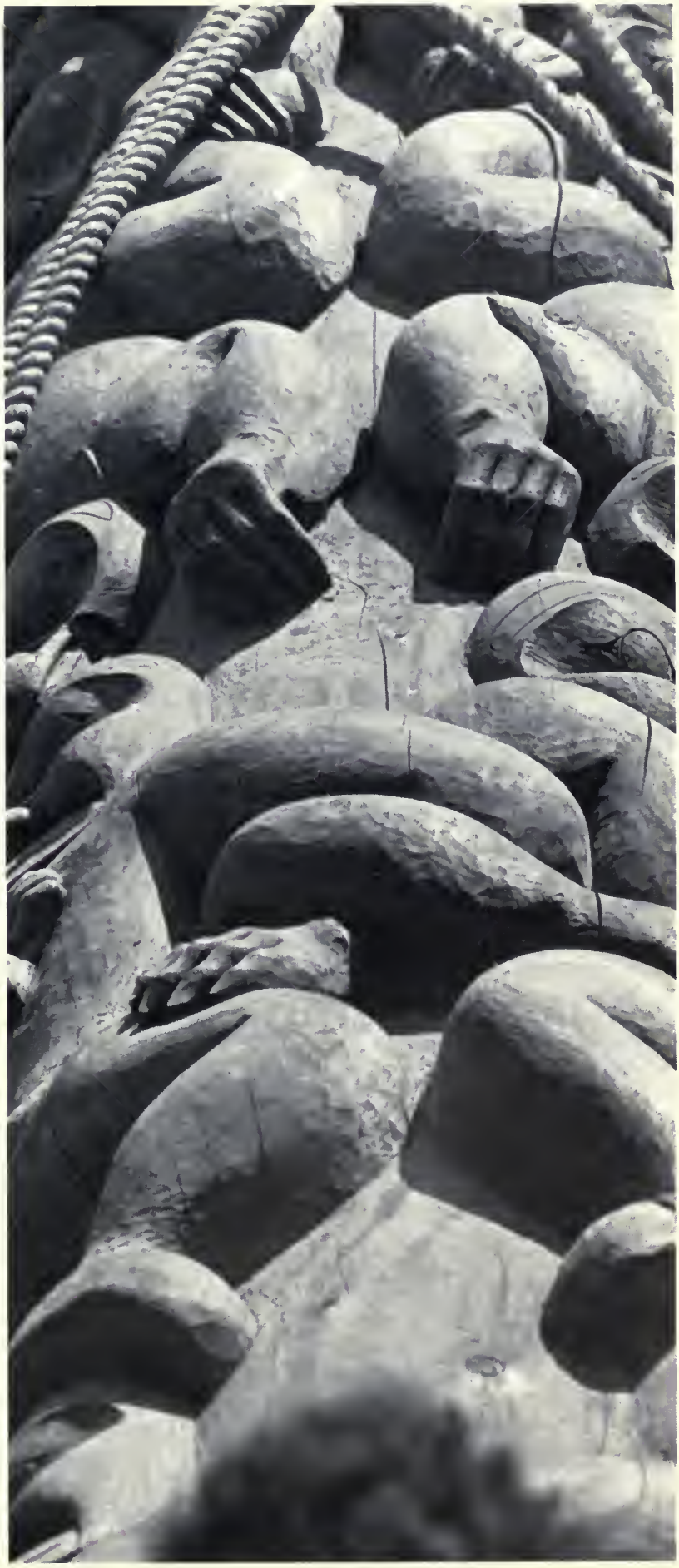
The story is about a family of five brothers. They were about to give a feast, and, to do so, had the responsibility to earn a lot of money. In those days money was measured in beaver pelts so the five brothers set off on a beaver hunt in the lake areas where there were known to be many beaver dams. The youngest brother was taken along to look after the pelts once they had been skinned. He was to count, record, and pack them.

Not long after they had set out, the brothers came across a family of beavers and the hunt began. Soon they had collected numerous pelts. In the process of the kill, the beavers scattered in panic in an effort to escape. Although many did not escape, two small beavers did manage to get away from the hunters. The younger brother, sitting on top of the hill, noticed these two small animals running away. He felt sorry for the struggling beavers and went down the hill to help them get away. He encouraged them to keep on running and also gave them assistance in getting over the larger dams that were in their paths. The younger brother showed the little beavers great sympathy and gentleness.

Eventually the two beavers disappeared into a bigger pond at the other end of the creek which held a very large beaver lodge. The younger brother noticed a smoke-hole in the roof of the lodge, which was used to let out smoke and let in light. He was puzzled. This was most unusual for the beaver dams. The ones he knew did not have smoke-holes. He peered down the smoke-hole just in time to see the two small beavers undressing! They were taking off their beaver clothing and the young man was surprised to see that the two little beavers were actually human beings. He continued to watch as they sat on the lap of the Beaver Chief and told him all about the slaughter in which their uncles and grandfathers were being killed at the other end of the creek.

The great Beaver Chief, dressed in beaver clothes and beaver headdress, began to sing the *Mourning Song* and dance the *Mourning Dance*. He also sang a *Cold Song* which called for a freeze over the lake to protect the remaining beavers that had managed to stay alive.

The younger brother heard the songs and saw the dance and felt saddened by the extent of the hunt. He decided to adopt the songs and the dance. As he watched he noticed a large Totem Pole standing beside the Beaver Chief which consisted of many carved beavers and was called the "Big Beaver" pole. The young man decided to adopt this pole as his family crest. He went back to his brothers to share his discoveries. He showed them the dance that the beavers had performed. He sang the *Mourning Song* and the *Cold Song*. The four brothers were also feeling remorseful that they had killed so many beavers. To show their feelings and in respect for the dead they decided to accept the younger brother's suggestion and adopted the songs and the dance of the beaver people. □



Above: Procession on April 23, preceding moving the pole. Right: Norman Tait addresses audience on Museum's north steps on April 24 prior to pole-raising. Chicago Mayor Jane Byrne is seated at left. Photos by Ron Testa.

Above: Rufus Watts (left), the Elder, grandfather of Norman Tait, wears Eagle Clan helmet. Norman Tait (right) wears Beaver Clan helmet. Left: The pole is about to be raised. Photos by Tom Hocker (above) and Ron Testa.

April 24, 1982: "Big Beaver" is raised. Photo by Tom Hocker.

PUPPETS EXTRAORDINAIRE:

Théâtre Sans Fil

(The No Strings Puppet Theatre)

James Simpson Theatre
June 26, 27
2:00 p.m.
Members: $3.00; Nonmembers: $4.00

This unique theatre medium of gigantic puppets (6 to 12 feet tall) makes its first appearance at Field Museum on June 26 and 27 with two American Indian legends, "Blue Sky Takes a Wife" and "The White Raven." The entire fascinating production is entitled "Tales from the Smokehouse."

Adults and children alike marvel at the striking visual and musical effects employed in the enactment of these ancient tales, in which more than 40 enormous puppets appear. Reviewers have termed the production "an absolutely elegant puppet show that brings a mythic experience to life in rapturous detail." The program, a Learning Museum event, is made possible by a grant from the National Endowment for the Humanities.

The only Canadian company to work with giant puppets, the Théâtre Sans Fil has developed new techniques for their fabrication and manipulation. The Théâtre Sans Fils was founded in 1971 and now has nine productions to its credit. The company's reputation has grown steadily over the years and it was chosen to represent Canada at the International Puppet Festival in Washington, D.C. in 1980.

For ticket information, please call (312) 322-8854. Tickets will also be available at the West Door box office one hour before curtain time.

FIELD BRIEFS

Philippine Exhibit Opens July 17

The largest special exhibit of traditional Filipino art to be held anywhere since 1905, "The People and Art of the Philippines", will be on view in Hall 26 from July 17 through December 31. (Members' preview Friday, July 16, 1 to 9 p.m.)

The exhibit includes loans from 16 museums and 14 private collections in the U.S., Europe, and the Philippines. The 400 objects in the show are selected to give a comprehensive view of the culture of this former Spanish and then American colony, now a major Southeast Asian nation. Special emphasis is given to the ceramics and gold of the prehistoric period, the Catholic arts of Spanish colonial times, the noted wood sculpture of the northern Philippines, and the extraordinary but almost unknown textiles of the southern Philippines.

"A Philippine Afternoon" will be held on Sunday, July 18, from 1 to 4 p.m., offering a variety of programs in connection with the new exhibit. There will be music, dance, and craft demonstrations. Indigenous Philippine dishes, reflecting the impact of Indonesian, Asian, and Spanish cultures may be sampled.

Members' Nights October 7, 8

The special evenings that all Members have been waiting for—Members' Nights —will take place this year on Thursday, October 7, and Friday, October 8, from 6 to 10 p.m. As in the past, the festive two-night open house will feature behind-the-scenes visits for all Members to curatorial areas, laboratories, preparators' workshops, and other facilities that are not ordinarily accessible to the public. Curators and other staff will be on hand to discuss their research and the collections with visitors. Live music will be featured in Stanley Field Hall and, of course, refreshments will be served.

New Hours Schedule

As of May 1, a new schedule of visiting hours to Field Museum went into effect. The new daily hours are 9:00 a.m. to 5:00 p.m., year-round. The day of the week during which no admission fee is required of nonmembers has been changed to Thursday (from Friday). In addition to these changes, the Museum will in the future be closed on Thanksgiving Day (beginning this year), as well as on Christmas and New Year's Day.

Commitment to Distinction Program

Field Museum's Corporate and Foundation Division Commitment to Distinction Program for 1982 and 1983 is under way. This program seeks financial support from the corporate and foundation community, and involves leading corporation executives in development efforts on behalf of Field Museum.

George R. Baker, executive vice president, Continental Illinois Corporation and Field Museum trustee, chairs the 1982-83 committee involving 10 section chairmen and more than 50 committeemen. Recently, section chairmen gathered at the Museum for an orientation meeting. This meeting provided valuable insights concerning the activities being conducted in the Museum's areas of scientific research, exhibition, and education.

Section chairmen for the 1982-83 program include: Daniel Calibraro, vice president, Corporate Communications, WGN Continental Broadcasting; Wade Fetzer, vice president, Investment Banking Services, Goldman, Sachs and Company; Thomas Hague, assistant to the chairman, Borg-Warner Corporation; Robert Jagel, vice president, Planning and Administration, Amoco Chemical Corporation; John Jones, senior vice president and treasurer, Chicago Bridge and Iron Company; Adrian Kruse, partner in banking, Ernst & Whinney; Donald Petkus, vice president, Commonwealth Edison Company; Stephen White, senior vice president, banking, Northern Trust Company; W. Denis Wright, senior vice president, Continental Illinois National Bank and Jay D. Proops, vice president and treasurer, Esmark, Inc.

Past support for Field Museum by the corporate and foundation community has been very generous and with the outstanding committee of corporate leaders currently lending their assistance, Field Museum's 1982-83 Corporate and Foundation Division will achieve the continued and increased support of the business sector.

Advisory Committee Named to Museum's Planned Giving Program

An Advisory Committee to the Museum's Planned Giving Program has been named, and recently held its initial, orientation

Fossil Loan to Smithsonian. *Fossils of six South American vertebrates and one cast were recently loaned to the United States National Museum (part of the Smithsonian Institution) for a special exhibit being mounted there. Jessica Harrison (right), research associate, and Dan Chaney (left), preparator, both of the Department of Paleobiology, USNM, are shown in Field Museum's fossil preparator's lab with some of the specimens to be loaned. With them are Field Museum's Larry Marshall (2nd from left), assistant curator of fossil mammals, and William F. Simpson, Field Museum's preparator of fossil vertebrates. Dr. Harrison stands by the carapace of a glyptodont; to the left is a mastodont skull; the large skeleton on the table is that of a giant ground sloth. Behind Harrison's hand is a cast of the smaller skull of a so-called "terror bird," or* Andalgalornis.

meeting. The committee will advise staff, participate in clinics and seminars, and generally make known the Museum's programs to professional associates and to others.

The committeemen, who will serve two-year terms, will work with two trustees of the Museum. William R. Dickinson, Jr., of Wilson & McIlvain, serves as chairman, and Hugo J. Melvoin, C.P., serves as vice-chairman.

The committeemen are: John P. Crilly, vice president and division head, Personal Banking and Trust, First National Bank of Chicago; Millard J. Grauer, CLU, Owens, Grauer, Dotterer and Dewyer; Addis E. Hull III, partner, Jenner & Block, and head, Estate Planning and Probate Division; Samuel W. Hunt, senior vice president and head, Trust Personal Services, Continental Illinois National Bank & Trust Company; Thomas F. Jones, Jr., senior vice president, Personal Trust Group, Harris Trust & Savings; Reinald McCrum, vice president, Trust Personal Financial Planning, the Northern Trust Bank; and Martin H. Rosenberg, executive director, Illinois CPA Society.

Women's Board presidents, past and present. *Shown at the May 5, 1982, Women's Board Annual Meeting are (L. to r.) Mrs. T. Stanton Armour (newly elected president), Mrs. Robert Wells Carton (president 1980-82), Mrs. Edward F. Swift (1978-80), Mrs. O. Macrae Patterson (1974-76), Mrs. B. Edward Bensinger (1972-74), and Mrs. Edward Byron Smith (1970-72). Not shown is Mrs. Joseph E. Rich (1976-78). The Women's Board was founded by the late Mrs. Hermon Dunlap Smith, who served as first president, 1966-70.*

New Women's Board Officers

The new president of Field Museum's Women's Board is Mrs. T. Stanton Armour, elected at the board's annual meeting, May 5. Mrs. Armour succeeds Mrs. Robert Wells Carton, elected in 1980. Other new officers elected at the meeting were Mrs. John W. Madigan, vice president; Mrs. Evan G. Moore, vice president; Mrs. George Barr McCutcheon II, recording secretary; Mrs. Philip D. Block III, corresponding secretary; Mrs. Angelo R. Arena, board member-at-large; and Mrs. Hammond E. Chaffetz, board member-at-large.

Continuing in their respective offices are Mrs. John C. Meeker, vice president; Mrs. Newton N. Minow, treasurer; and Mrs. Ben W. Heineman, board member-at-large.

Public Relations Manager Honored

Mary A. Cassai, Field Museum's public relations manager, has received a 1982 Merit Award from the Publicity Club of Chicago for individual management of a publicity campaign in the "Institutional Programs" classification. The award was given for the planning and coordination of a print-television-radio program on Field Museum produced by the advertising firm of D'Arcy-MacManus & Masius, Inc.

The award is given to the top ten percent of advertising and public relations professionals in the Midwest. Last year Cassai was also honored by the Publicity Club of Chicago for outstanding promotion of the "Great Bronze Age of China" exhibit.

Mr. Hisazo Nagatani, *center, is presented a certificate by Field Museum President Willard L. Boyd at a dinner in Nagatani's honor, March 30. The certificate named Nagatani, donor of many fine works of Chinese and Japanese art, as a benefactor of the Museum. Seated at right is Dr. Laurence Sickman, distinguished sinologist and former director of the Nelson Gallery, Kansas City, Mo.*

"Azure Dragon," from stone coffin of Wang Hui, Szechuan, Han dynasty, 56 x 122 cm, #233583.

Records from Stone

by ALICE K. SCHNEIDER
Associate, Department of Anthropology

The first time I exchanged appreciations with an elderly Chinese scholar on his country's art, he inquired, "Are you familiar with Chinese robins?"

I gazed at his open, smiling face for clues to his meaning, but could only lamely reply, "No, I didn't know there was a separate species."

Last summer I was to give a slide-show talk on Chinese rubbings, a subject I had been closely involved with for more than 15 years—ever since the "robins" were straightened out. The talk was to be for a senior citizens' study group, and on the morning of the presentation I overheard a lady tell her husband that she wouldn't be able to join him for their customary afternoon stroll because she planned to attend a session on "Chinese massage."

So what are these elusive objects, these Chinese rubbings? They are simply prints, misnamed "rubbings" because in English we do not have a close equivalent for that art form: impressions made by tamping indelible ink on mulberry paper that has been placed over an incised surface, usually stone or wood. This is called the "wet" method, as distinguished from the "dry."

In the latter, paper is truly rubbed with charcoal or crayon. Because dry, or "English rubbings" (so-called because most were made from inscribed tablets in English churches), are more familiar to us, we borrow the term "rubbings." The wet technique far outlasts the dry (I have seen a rubbing fragment from the seventh century). But for some reason, the wet method continues to be used almost exclusively in the Orient, notably in China and Korea.

Still less familiar to the western world are the engraved stones themselves and what they represent: more than 2,000 years of cultural history. They include not only important commemorations comparable to those found in the ruins of other ancient civilizations, but a variety of documents as well as religious works. This information is rarely found in books published in the West on China, possibly because there has never been a comprehensive study of this remarkable phenomenon in either East or West. But 80 years ago the exciting potential of this material came to the attention of a young sinologist, Berthold Laufer.

In 1901, Laufer, a recent emigrant from Cologne to the United States, was sent to China to obtain artifacts for New York's American

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Catalogue of Chinese Rubbings from Field Museum (1981), 746 pp., was researched by Hoshein Tchen and Kenneth M. Starr, prepared by Alice K. Schneider, photographed by Herta Newton and Field Museum Division of Photography, and edited by Hartmut Walravens. Fieldiana Anthropology New Series Number 3; $67.50.

Museum. While there, he was advised by Chinese scholars that for research purposes he must have rubbings made from the engraved stones which were to be found in temples, imperial buildings, and their courtyards. The easily transportable rubbings would provide an inexpensive permanent library of research tools from original sources that he could always use in the convenience of his own study.

Ultimately, Laufer acquired some 4,000 rubbings in China, shipping them back to the American Museum for safekeeping. In time, the collection was to be one of the largest and most comprehensive in the world. But for many years, because of Laufer's involvement in so many other research activities, he had little opportunity to use these rubbings. In 1907, Laufer joined the curatorial staff of Field Museum, and in 1923, upon his request, the American Museum presented the entire collection to him.

In 1929 Laufer sought funds to finally research and catalog the collection. He proposed the establishment of an "Oriental Research Institute" in Washington, D.C., which would underwrite his "project of a corpus inscriptionum Sinicarum," as he called it. Over a period of 15 years, the rubbings were to be cataloged into 15 volumes. The projected cost: $150,000. But in October, 1929, the American economy collapsed, and the ambitious project never materialized. A catalog of only the non-Chinese portion of the collection was published in his lifetime. Laufer died in 1936, leaving a body of published and unpublished work that was as remarkable for its intellectual amplitude as for its size. Included in his will was a bequest to the Field Museum of his entire library of rubbings.

It was fitting that the cataloging of the rubbings collection was finalized by another scholar equally dedicated to achieving a bridge between the cultures of the East and West: Dr. Hoshien Tchen, a refugee from China who came to Field Museum in 1954; he remained until 1973, serving as consultant for the East Asian collection.

A collector of Chinese art as well as former legal adviser to the Palace collection in Peking,

"Prancing Deer/Horse and Rider", tomb brick relief from Szechuan, mid-2nd century; 43 x 44 cm; #233533.

"Landscape, Pine Tree, Cranes," from Confucius Temple, Hsi-an; 189 x 79 cm, #244810.

Tchen was curious to view the Field Museum's holdings in Chinese art and artifacts. What was not then known, not even to Dr. Kenneth Starr, the East Asia curator, was the importance of the contents of some 30 boxes from the American Museum that had remained in storage for more than a quarter century. Dr. Tchen has spoken often of opening these boxes as "a tremendous, exciting discovery," describing their contents as "the best part of the Chinese collection."

In 1961 Starr and Tchen began to curate the rubbings collection, Tchen doing the research, largely with the aid of Chinese sources, and Starr doing the editing—a responsibility I gradually took over after coming to the Museum as a volunteer in 1965.

Cataloging collections is a large part of museum work. Usually it involves identification of the specimen, determination of its age and provenience, when and where it was obtained by the Museum (not always identical with provenience), physical characteristics, by whom it was made, etc. A photo, ideally, rounds out the catalog entry—all of this posted on a 3 x 5 index card for the curator's file and duplicated in a set of ledgers, kept in the department office. Today, in Field Museum's Department of Anthropology, most of this information has been stored in a Computer as well. (See "Cannibals, Catalogs and Computers," September 1977 *Bulletin*, p. 10.) In the late 1950s, Starr designed an 8 x 11-inch card that would accommodate more information about the rubbing or engraving it documented.

Fortunately, for those of us interested in Chinese antiquities, cataloging in that country is an ancient, highly respected tradition, and among the Chinese literati there is also a cherished tradition of collecting objects of historic or aesthetic value. So in addition to information available in public archives, were those orderly notebooks kept by private collectors; some collectors even published memoranda on their art works or antiquities. And then there were the *ti-pos*—colophons written on the mountings of valuable rubbings, sometimes even engraved into the stones.

However, from the mid-Ming dynasty (*ca.* 1500) on, the Chinese did not consider their contemporary engravings important enough to record. By then, many engravings were recuts, copies of older stones which time had worn away or which had entirely disappeared, leaving only rubbings to trace from. Therefore, for those rubbings not described in any publication, Tchen had to glean his data from the rubbings themselves—no simple task. This required the ability to read classical Chinese (a skill roughly comparable to that of a present-day Englishman reading Chaucer), for many inscriptions were

written in this antique style. It also required a familiarity with the Chinese classics and their writers, with collections of rubbings and their collectors, artists, calligraphy and writing styles of various periods, and an eye for recognizing a recut stone. Few young people in China today can do any of this.

This ability to distinguish between originals and recuts was perhaps the most recondite of the skills involved. Recuts were made at least as early as the Sung dynasty (960-1279), and in some instances there were even forgeries of famous calligraphers. A recut was made from a fresh stone slab on which a rubbing of the original stone had been imposed as a pattern. Recut engravings, therefore, contained all the original information, including dates, signatures, and even seals of the original. Recut stones were also made from copies of earlier copies of possibly a freehand copy of an original painting.

The condition of a rubbing is not necessarily an indication of its age; the condition depends on how well the paper has been preserved. I have seen beautiful rubbings from the Sung dynasty which had been carefully preserved in private collections; I have also seen twentieth-century rubbings that were already victims of neglect.

Laufer's meticulous field notes were of particular help to Tchen—except for his data on proveniences. For the last millennium, inscribed stones of historic significance had been removed from their outdoor settings to pagodas, temples, and other structures that offered some protection from the elements; but in being moved, information about the original site was not always recorded. For this reason, the provenience given for a large number of rubbings in our collection may be a particular temple, though that temple was in fact merely a repository.

An early catalog, based upon Laufer's field notes, had been prepared by C. Y. Hu and Rose G. Miller, who worked at Field Museum between 1939 and 1944. In his research, Tchen frequently referred to the Hu-Miller catalog; but mistakes and omissions had to be corrected. And Hu-Miller covered only the acquisitions made by Laufer, not later additions to the collection.

Rubbings acquired from other people, such as some 300 fascinating prints made from Han (206 B.C.-A.D. 220) tomb tiles and stones in Szechuan by D.C. Graham in the 1930s, required sources of information other than Hu-Miller. These various sources were not always in agreement. In contrast, a well known private collection of old rubbings mounted in book form and purchased by the Museum in the 1960s was thoroughly documented. Tchen often referred to our work as "very delicate" because it was so easy for errors to be committed.

Catalogue of Chinese Rubbings from Field Museum

In early 1972 it looked as though we were actually going to finish researching this vast collection. Our completed 8 x 11 catalog cards could have made a stack nine feet high. The rubbings—some as large as 4 x 7 feet—were all returned to their enormous storage cabinets. One final question remained: What was to happen now?

Was all this work to remain buried in storage, the final resting place of so much research, or should it be made available to scholars hungry for research tools? Few scholars knew of this collection, even fewer that information about each item in the collection was now readily accessible. A modest catalog list would do; but how does such a list reach its intended readers? Dr. James VanStone, editor of *Fieldiana*, the Museum's continuing monograph series, proposed that a comprehensive compendium be prepared. I blithely agreed to spend one more year on this work. It was to take nine.

Approval for publication in *Fieldiana* was dependent upon several conditions: first, confirmation by a recognized scholar in at least a closely related field that the results of our research were worth publication. This posed something of a problem since there was no authority in this country on Chinese rubbings. Funding for the project was also required. In addition, compiling a book required an editor with a thorough knowledge of Chinese. Dr. Tchen would no longer be available. Reaching the respectable age of 80, he was to retire in 1973.

Fortunately, none of these problems proved insurmountable. Professor T. H. Tsien, director of the University of Chicago's East Asian Library, and an eminent authority on the development of writing in China, heartily approved the idea

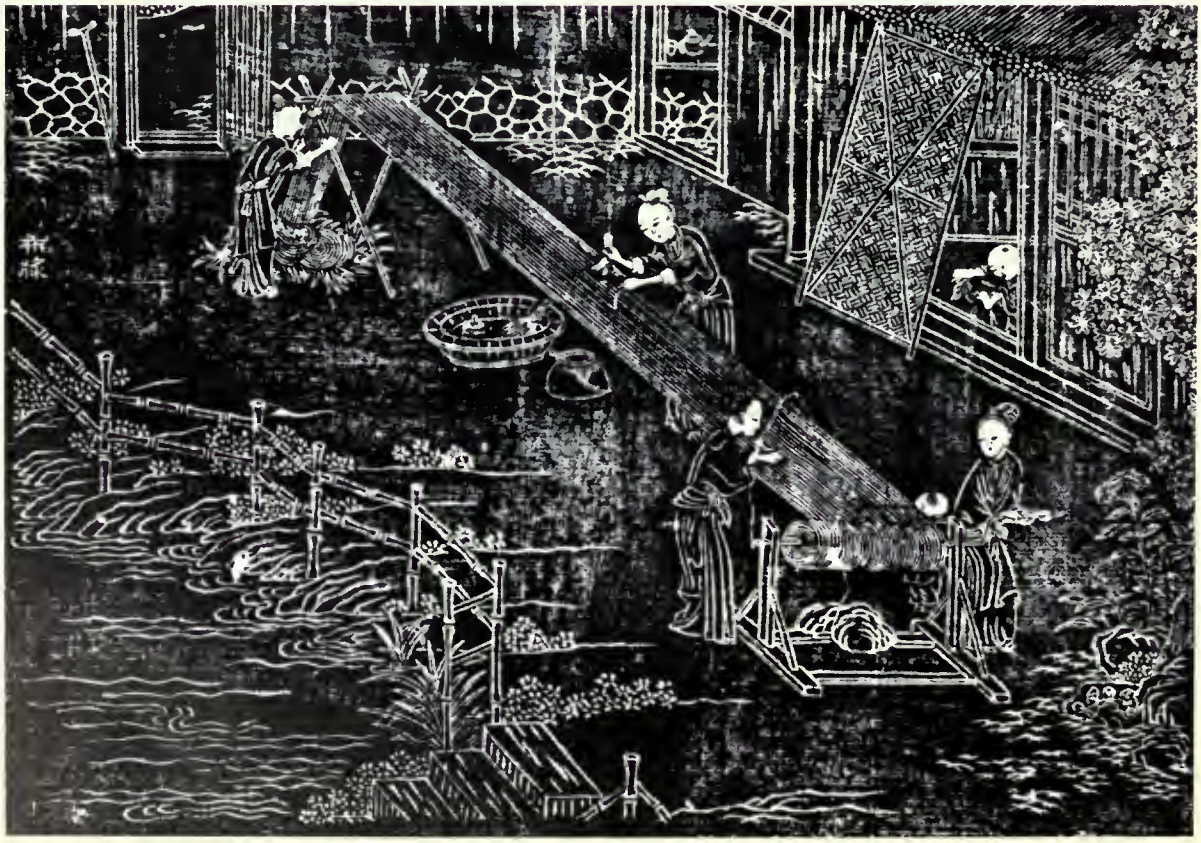
of the proposed work. He based his endorsement on recognition of the importance of the collection and on his respect for the scholarship of Dr. Tchen. Funding for the project was obtained from the National Endowment for the Arts. And from Laufer's home town of Cologne, in 1974, came another young graduate in Chinese studies and one of the world's three experts in the Manchu language, Dr. Hartmut Walravens. He had come to examine manuscripts of Laufer's for a bibliography he was preparing, and he remained, in his words, "to act as midwife" for the rubbings collection catalog.

Walraven's contributions went far beyond the duties of editing. He compiled an extremely useful bibliography from Tchen's sources—a task that would have been an impossibility for me, since most of these sources were in Chinese. He did further research in areas of his expertise such as Manchu, Mongolian, and on rubbbings from two Christian cemeteries in China, which were of particular interest to him. He also helped to design and execute the extremely complicated indices and other sections of the book. He did the editing in Cologne and later Hamburg, over a period of years, for it had been agreed that we would work by mail. I was to send him duplicates of manuscript copy in installments of about 100 sheets each to minimize difficulties in the event of loss. And indeed one packet was lost with neither of us being aware of it at the time.

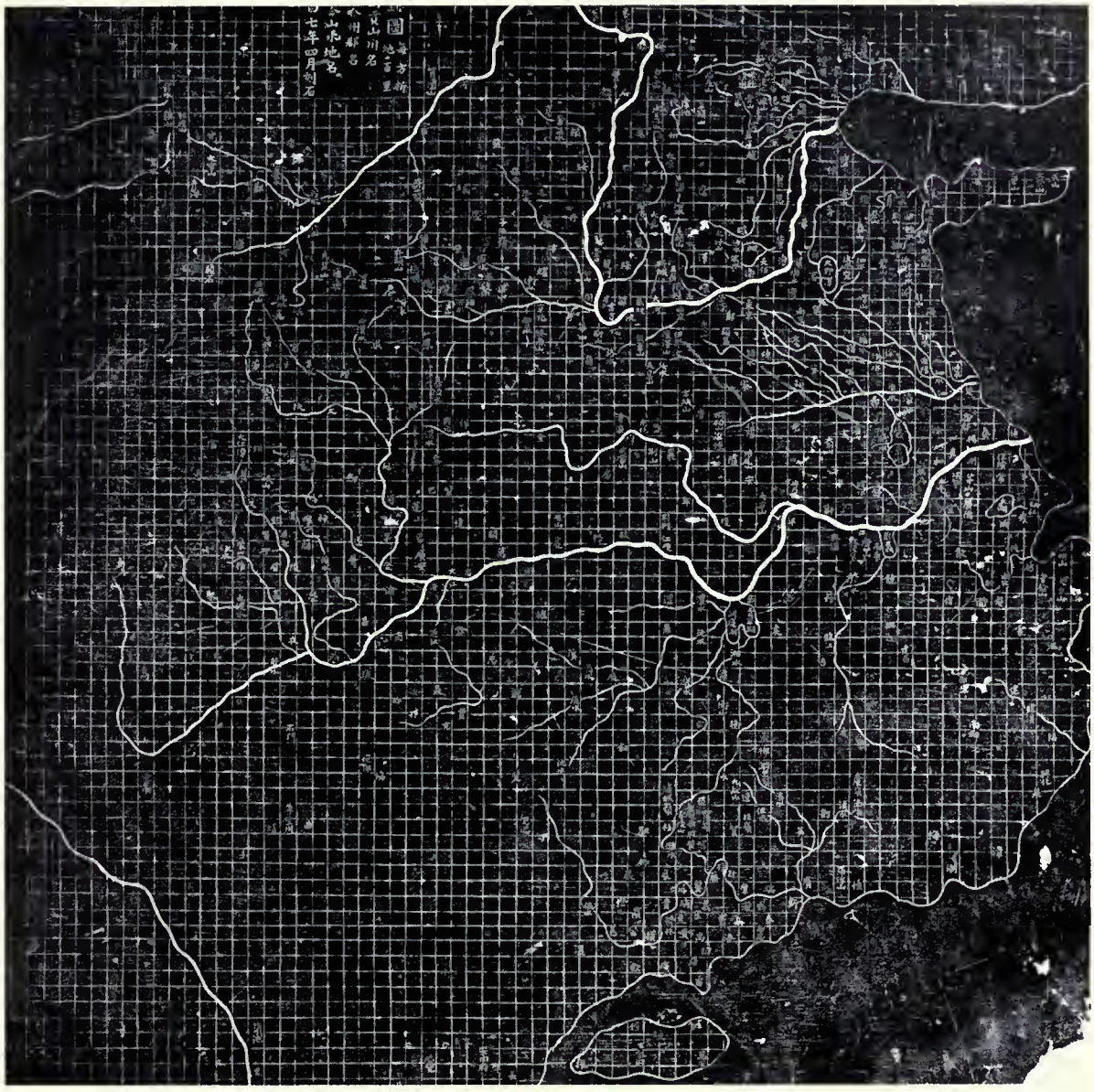
The Post Office had placed its stamp over my envelope number. By the time we realized that a packet was missing, a complete numerical order of catalog entries had been worked out. As a consequence of the loss the numbering had to be redone—a task of several months. This was just the beginning of many problems exacerbated by thousands of miles between us. Because of a long delay in receiving an anticipated introduction, both of us—independent of the other—solicited another. After four years we had three!

A specialist in Arabic was needed. Walravens found one in Germany; I found one here. And the opinions of the two on certain texts differed. Duplicates of file cards, prepared because there were duplicate rubbings in the collection, were endlessly turning up; so the duplicate entries they generated in the book had to be weeded out. Even some new rubbings materialized, overlooked by Tchen and myself in our research. And finally, two boxes of rubbings sent to us by the American Museum in 1970 turned out to be ours; they, too, had to be included. Unaccountably, these Laufer rubbings had remained at the American Museum all these years. The appendices grew.

It was at this point that reconstruction of rooms in the Department of Anthropology began. The incessant drilling of pneumatic hammers and flying dust made work there so difficult that I bought an electric typewriter and continued the project at home.



One of 16 illustrations of steps in processing cotton, from stone slab in the Imperial Palace, Peking; 1765 or later; 26 x 26 cm, #118293. (Cropped at top)



Map of China during general Sung period and places visited by the legendary Emperor Yü, from Confucius Temple, Hsi-an, dated 1137; 79 x 78 cm; #245523. This has been described by scholars as the most remarkable cartographic work of its age in any culture.

In May, 1977, five years later, the finished manuscript was submitted to the *Fieldiana* editor for final processing before being typeset. What had we accomplished? A behemoth catalog of 2,014 printed rubbing entries with titles in English and Chinese characters, plus transliterations. Some titles, where called for, were done in transliterations of Manchu, Mongolian, Tibetan, etc. Individual indices of titles, personal names, temples, proveniences, and so forth, as well as the usual subject index ran to 148 printed pages. The indices alone had involved three years of cross-checking, shaping, and refining by several dedicated volunteers as well as by Walravens and me. The illustrations filled 137 full pages.

Again, a dedicated volunteer, Herta Newton, a former professional photographer, and I, working three days a week at the Museum, "finished" the photography for the book in two years. Not that the selection of photographs was by any means then completed; it was most difficult to represent pictorially a collection of such enormous proportions and variety. In the case of very large rubbings of calligraphy, only details were photographed, because it would have been impossible to see anything adequately in a small photograph.

Still ahead were four years of editing and proofreading by the *Fieldiana* editor and several of us, paid and unpaid, associated with the project.

Why do we do these things?

Fortunately, we cling to ideas, beliefs, and morsels of encouragement. I had absorbed Dr. Tchen's conviction that we were compiling the first catalog of its kind anywhere in the world, important not only because its subject was rubbings, but for its extraordinary breadth and scope. The final product, I am satisfied, is a valuable, unique research tool—"Project of a Corpus Inscriptionum Sinicarum," even though I had known nothing of Laufer's ambitious attempt until after the book was finished. □

Probing the Roots of The Lincoln Park Totem Pole

by VIRGINIA A. LESLIE

The City of Chicago can boast of two monumental family trees: carved cedar totem poles from the Pacific Northwest Coast. One was acquired by the city more than half a century ago; the other went on view outside Field Museum on April 24 of this year.

The former is a 40-foot pole located in Lincoln Park at Lake Shore Drive and Addison Street. It was given to the Chicago Park District in 1929 by James L. Kraft, founder of Kraft Foods, Inc. (now Kraft, Inc.), and dedicated to the schoolchildren of Chicago. It is the remarkable story of the Lincoln Park pole that concerns us.

Mr. Kraft, an accomplished lapidary and collector of jade, made trips to Alaska and the Pacific Northwest in his search for jade and other rare minerals; while on these trips the unique art and culture of the Northwest Coast Indians attracted him. In 1926, after several years' negotiation, he purchased through intermediaries two totem poles (including that in Lincoln Park) and a 15-foot-long feast dish; the three huge carvings were shipped to Chicago from British Columbia on railroad flatcars.

Lincoln Park totem pole as it appeared at Alert Bay, B.C., about 1910. Courtesy American Museum of Natural History.

In 1927 the feast dish was given to the Wisconsin State Historical Society, in Madison, and in 1952 the society loaned the dish to the Thomas Burke Memorial Washington State Museum at the University of Washington in Seattle, where it remains on exhibit.

One of the totem poles now stands on private property, "Kraftwood Gardens," of the Kraft family in northeastern Wisconsin. The other pole lay on the Chicago River dock of a Kraft plant for three years. Finally, in 1929, James Kraft gave the pole to the City of Chicago. It was erected in Lincoln Park and officially dedicated in June of that year.

Preparations at Field Museum for the new maritime peoples exhibit in Hall 10 (which features 24 totem poles) stimulated renewed interest in the Lincoln Park pole. Dr. Ronald L. Weber, visiting assistant curator for the Northwest Coast Project, was skeptical of information on the pole's bronze plaque, which attributes the pole to the Haida of the Queen Charlotte Islands, British Columbia. For a number of reasons, including stylistic features and motifs in the pole's design, he concluded that it was actually the work of the Kwakiutl of Vancouver Island, rather than of the Haida. His doubts led to my investigations.

Kwakiutl poles are often dramatic and colorful, as is the Lincoln Park pole. Kwakiutl pole figures are frequently painted in several colors, notably white and green, and the proportion of head to body of carved figures is relatively realistic; thunderbirds and eagles are embellished with outstretched wings and other appendages for heightened effect. Haida poles are greater in diameter than the Kwakiutl. Carving is deep in Haida poles, but the cylindrical form of the log is retained; large and small creatures are intertwined, prominent heads are half the full length of figures, and detail work in Haida poles is

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Virginia A. Leslie was a volunteer for the Northwest Coast Project.

more apt to be carved than painted; red and black are used, but sparingly.

Several Northwest Coast symbols are missing from the Lincoln Park pole or are incorrectly placed. Plumes characteristically found on the thunderbird's head are missing, but those of a seésioohl (mythological serpent) are between the whale's tail and the thunderbird's claws; the whale has large, outspread wings, though winged whales are not to be found on any other known Northwest Coast pole or even in the mythology of the region.

The probable explanation for these oddities is that before the two poles were shipped to Chicago, the wings and plumes were detached to prevent damage. When reassembled, the thunderbird's wings were correctly attached to the Lincoln Park pole, but both the thunderbird's wings and the seésioohl plumes of the Wisconsin pole were reattached by mistake to the Lincoln Park pole. A rudimentary set of wings unlike any to be found on Northwest Coast poles were added to the Wisconsin pole; apparently these were carved in Wisconsin.

Close inspection of photos taken at Alert Bay between 1903 and 1910 leaves no doubt that the two poles once stood in that village and are of Kwakiutl, not Haida, origin. There are also paintings by well known Canadian artist Emily Carr of these poles as they stood at Alert Bay in 1912. According to information in the Kraft archives, the two poles are so old that no one knows when they were carved, but Alert Bay was settled in the 1870s, and 1898 photos of the village fail to show them.

Further evidence that the Lincoln Park pole is Kwakiutl rather than Haida is to be found in records about the pole held by Kraft: "It was not carved by human hands," says a recorded legend, "but came floating down the Nimpkish River in prehistoric times to the steelheaded man,... founder of the tribe, as a symbol of protection from the Great Spirit." The Nimpkish River flows into Johnstone Strait, across from Alert Bay (home of the Kwakiutl). This is some 200 miles south of the Queen Charlotte Islands (home of the Haida).

The bronze plaque in front of the Lincoln Park pole names that pole "Kwa Ma Rolas," which, says Bill Holm (curator at Thomas Burke Museum), is a corruption of "Gwa mo las," or "K'wamaxalas"—the name of the Alert Bay owner of the Wisconsin pole. Kraft's intermediaries, probably not well informed about Northwest Coast art, were apparently confused about the poles' identities and legends. "The Kraft version of the myths," says Holm, "includes many correct names and recognizable snatches of the stories, but it has all been garbled."

The pole that once stood before Chief

Lincoln Park totem pole about 1967 (left) and during 1929 dedication ceremony (right). Note differences, particularly in painted design. Photos courtesy Kraft, Inc.

Waxawidi's house, in Alert Bay, is described by Holm as having "a thunderbird at the top, next a baleen whale (Gwa' yam) with a man on the back and at the bottom a sea monster. The baleen whale has a small dorsal fin, very long pectoral fins, and a row of white spots on each side." This description of the whale accurately describes that on the Lincoln Park pole. "By comparison, the killer whale on the Kraftwood Gardens pole has a very long dorsal fin, short wide pectoral fins, no spots, and a differently shaped head." The idea of the Haida origin and antiquity of the two poles, he concludes, "is preposterous."

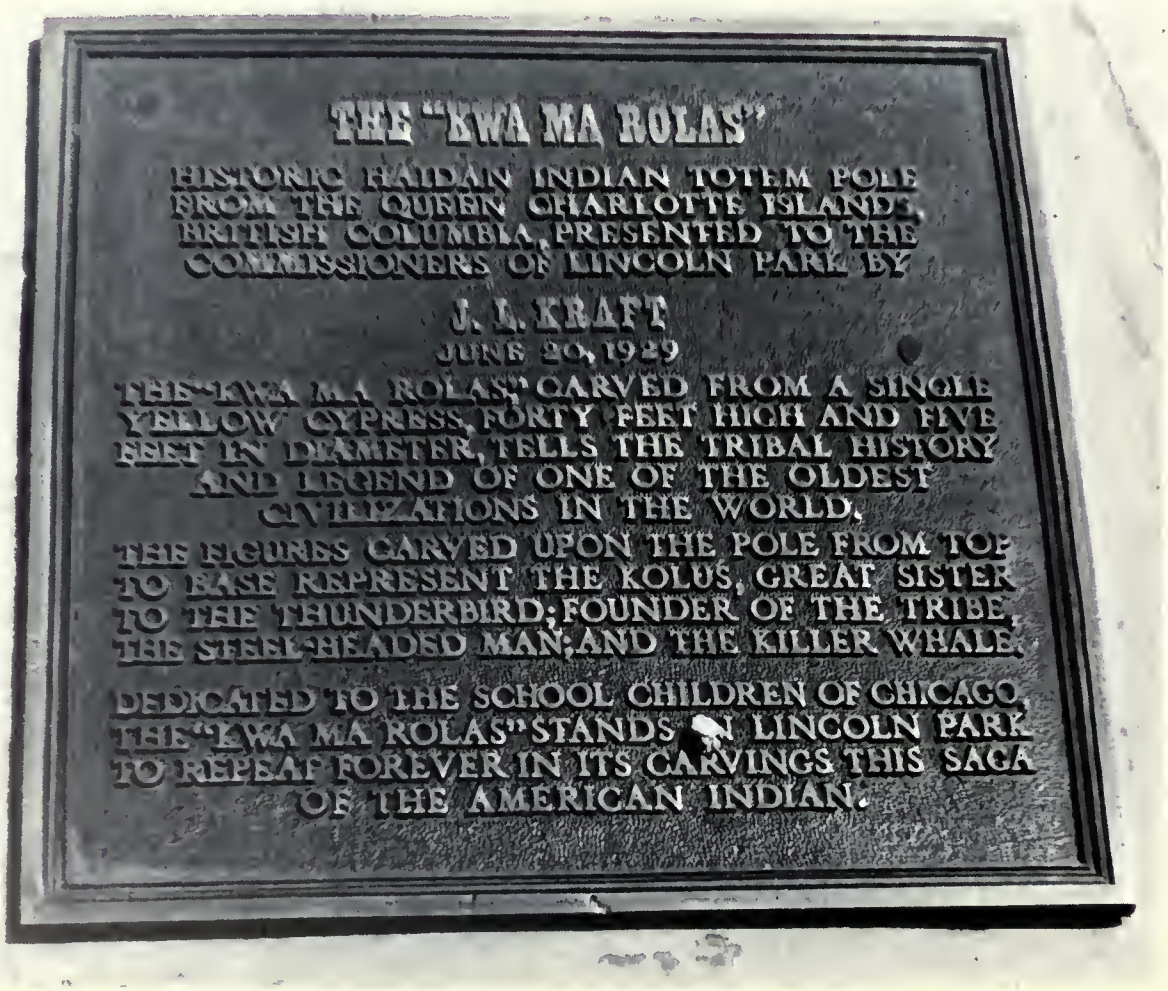
Gloria Cranmer Webster, curator of U'Mista Cultural Society at Alert Bay and granddaughter of Chief Gwa mo las, reports that in 1978 her brother Doug Cranmer designed a new version of the Gwa mo las pole in honor of their father. The pole bears a striking resemblance to the Kraftwood Gardens pole.

So we have every reason to believe that the two poles (as well as the feast dish now in Seattle) were carved by the Kwakiutl of Alert Bay in the early 1900s. Perhaps the mistake of attribution of these three pieces is partly because a number of small Haida argillite (dark carbonaceous slate) sculptures were also shipped in 1926 to Kraft from the Queen Charlotte Islands.

Conservation of the Lincoln Park Pole

The victim of carpenter ants, vandals, and the normal processes of weathering and decay, the Lincoln Park pole has undergone more than a dozen modifications since 1929. All of this restoration has been done under the direction of Kraft, since it was arranged at the time of presentation that the company would continue to assume the task of maintenance.

In 1958 the arm positions of the pole's human figure were changed because rotting had occurred in the arm sockets; one hand was moved so that it covered the figure's eyes. (A visitor observed that the figure no longer had to watch the spectacle of rush hour traffic which passed before it.) In 1966 the pole was drastically renovated: the sea monster at the base, the thunderbird at the top, and the human figure



Bronze plaque at Lincoln Park totem pole. Corrected, it should read: "Waxawidi, historic Kwakiutl Indian totem pole from Alert Bay, Vancouver Island, B.C., carved from a single red cedar. The figures from top to base represent the Kulos, member of the thunderbird family, the baleen whale with a man on its back".

The Kraftwood Gardens (Wisconsin) totem pole as it appeared in Alert Bay, B.C., about 1910 (left pole in left photo), and in Kraftwood Gardens, about 1950. Left photo courtesy Vancouver Museums and Planetarium Association—the Vancouver Museum; right photo courtesy Edith Dahlberg.

were recarved by skilled Kraft workers. Their work appears to be a faithful attempt at restoration, but the painted symbols were inaccurately reproduced. The significance of features in the original painting, which had been more elaborate, could never have been appreciated by a restorer unacquainted with Northwest Coast art. A Kraft supervisor of the restoration has suggested that Kraft workers trying to copy the intricate symbols perhaps didn't realize how important it was to duplicate features with great accuracy. The original painted symbols on the pole have almost totally disappeared.

Kraft has tried conscientiously to hold back and to repair the onslaughts of time as well as acts of vandalism against the pole. This historic monument should be restored to its original form by a skilled Kwakiutl craftsman. □

Of particular help to the author in researching this article were Ronald L. Weber, visiting assistant curator in Anthropology, Field Museum; Bill Holm, curator of Northwest Coast Indian art at the Thomas Burke Memorial Washington State Museum at the University of Washington in Seattle; Peter Macnair, curator of anthropology at the British Columbia Provincial Museum, Victoria, B.C.; Everett Kuhn, Sarah M. Mauro, John X. Thomas, and Albert F. Schuber—all of Kraft, Inc.; and Edith Dahlberg (daughter of James Kraft), who loaned photographs and other material. Additional information was found in the Chicago Historical Society Library and in archives of the Chicago Park District.

Field Museum Tours for Members

Australia Tour

August 23-September 12
Tour Price: $4,998 (double occupancy)

Leader of this extraordinary tour is Dr. Alan Solem, curator and head, Division of Invertebrates, who has made nine trips to Australia in connection with his study of land snails. The tour will feature the glory of the Western Australia spring, the greatest display of wildflowers in the world, the charm of an English countryside in South Australian vineyards, a face-to-face meeting with eastern Australian wildlife in Victoria, and the awesome expanses and spectacular mountains of central Australia.

The tour will arrive in Sydney on August 25, then take a 75-minute flight to Melbourne. The two days in Melbourne will include visits to a local wildlife sanctuary as well as to various sites of cultural interest.

A 40-minute flight on August 27 will take the group to Adelaide, followed by visits to local vineyards. A 90-minute flight that evening will terminate at Alice Springs, the group's base of operations for six days. Highlights here include sight-seeing into the outback, bush barbecues, and a visit to spectacular Ayers Rock.

September 3 will be spent in and around Perth. Rides by hydrofoil and river boat will be optional. September 4 will be spent traveling by motorcoach to Augusta while viewing some of Australia's most delightful scenery.

September 5: A trip to Walpole-Normalup National Park, seeing 200-foot-high stands of red tingle trees, September 6: Colorful Albany, an old whaling port. September 7: A day trip to the Porongorup and Stirling mountain ranges.

September 8: Return to Perth via the Albany Highway, with views of the Darling Range. September 9: Perth, with time for shopping and sight-seeing. September 10: In Sydney for a day of leisure for shopping, sightseeing, or day tours.

September 11: Depart from Sydney for U.S. Having lost a day by crossing the International Date Line, we overnight at San Francisco's Sheraton Airport Hotel.

September 12: Arrival in Chicago.

For additional information on this tour, please write or call Dorothy Roder, Tours Manager, at Field Museum, 322-8862.

REINDEER TRANSPORT IN ALASKA

by JAMES W. VANSTONE
Curator of North American Archaeology and Ethnology

Eskimo herders with reindeer at Port Clarence, Seward Peninsula, Alaska. Note small stature of reindeer. N17013

In 1892 domestic reindeer were brought from northeastern Siberia to the southern Seward Peninsula region of western Alaska through the joint efforts of the Reverend Sheldon Jackson, Presbyterian missionary and first general agent of education in Alaska, and Captain Michael A. Healy of the U.S. Revenue Marine Service.

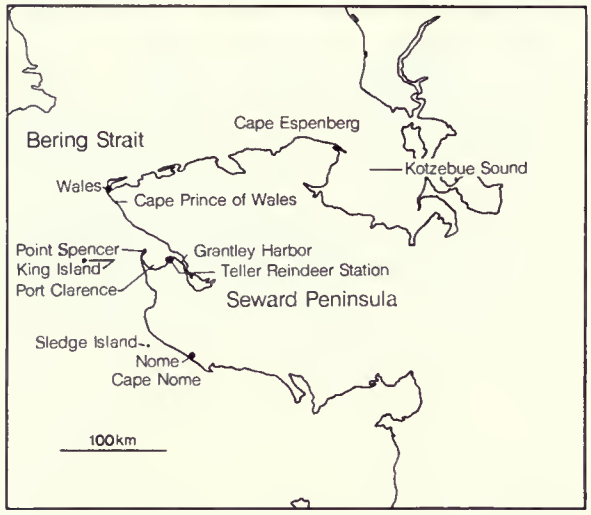
This relocation program, supported by the U.S. Bureau of Education, was intended to provide Alaskan Eskimos with a new source of food that would offset a recent decline in sea mammals; during the second half of the nineteenth century, commercial interests had indulged in unrestricted killing of whales, walrus, and seals. There also appeared to be a small market for the meat and skins of the reindeer, and it was hoped that Eskimos could derive a cash income from their sale.

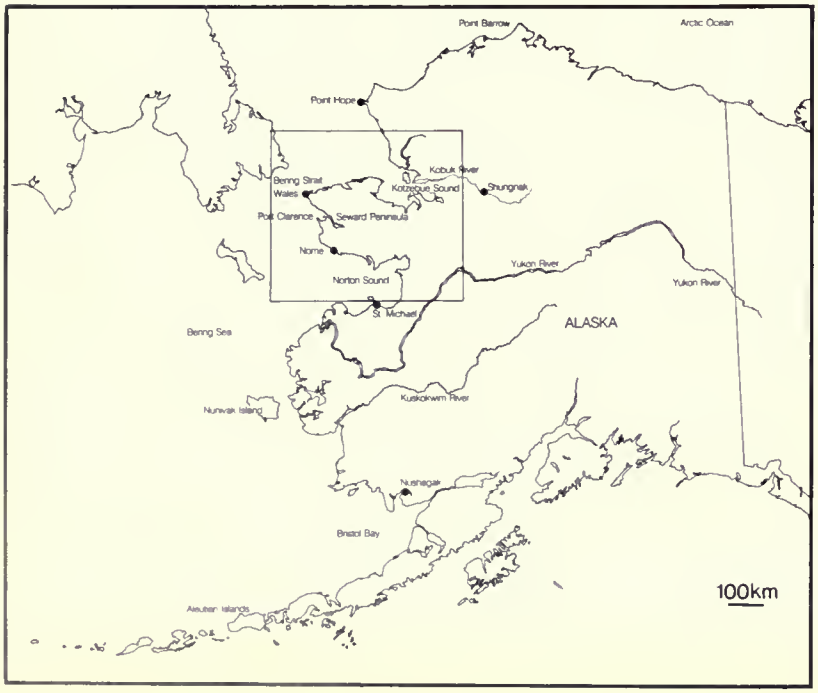
The first deer were landed by the U.S. Revenue Cutter *Bear* in July 1982 on the north shore of Port Clarence at a place that the Reverend Jackson had named the Teller Reindeer Station (after John M. Teller, a United States senator who had helped steer appropriations for the project through Congress). Chukchi herders were brought from Siberia to teach Eskimos the techniques of herding and the proper methods of caring for the animals. Between 1892 and 1902 more than 1,200 reindeer were landed at Teller and, as herders were trained, the deer were eventually dispersed to Eskimo communities.

At the opening of the station, Miner W. Bruce, a former Nebraska journalist, was appointed superintendent. He and one assistant had charge of four Chukchi herders, an equal number of Eskimo apprentices, and approximately 175 reindeer. Bruce served as superintendent for only one year, then became a trader to widely scattered areas of Alaska, where a sizeable portion of his business was the collecting of Eskimo manufactures for resale. It was during this period that he negotiated sales of important collections of Eskimo material culture to Field Columbian Museum (later named Field Museum of Natural History); these were acquired by the Museum in 1894 and 1896.

The Reverend Jackson, who traveled extensively in Alaska every summer between 1886 and 1906, also obtained Eskimo artifacts, and his collection of approximately 270 undocumented specimens from western and northwestern Alaska was acquired for the World's Columbian

The Reverend Sheldon Jackson, Presbyterian missionary who helped introduce reindeer into Alaska. N108676



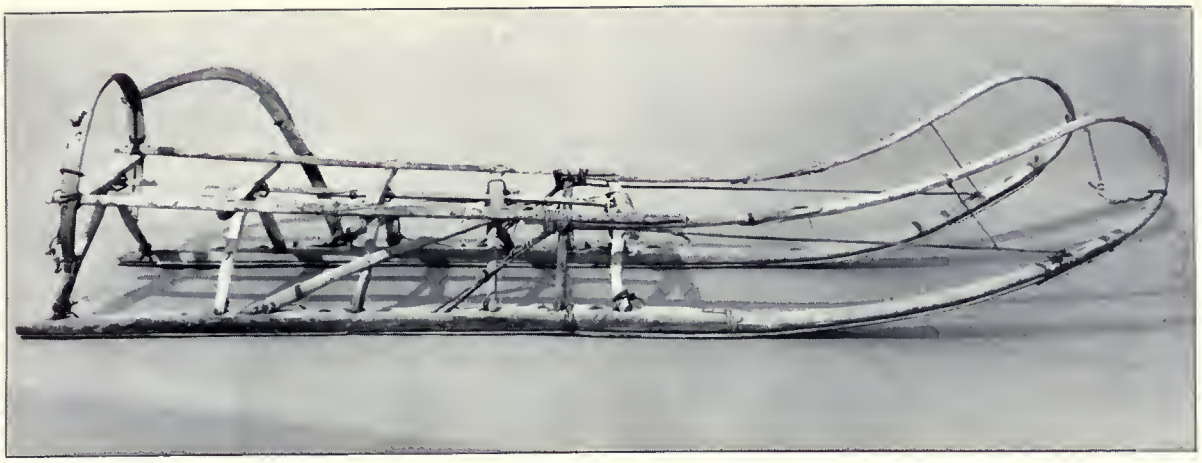


Exposition and accessioned by Field Columbian Museum in October 1893 (accession 126). This collection contains a number of interesting specimens associated with the reindeer project and related to the use of these creatures as draft animals.

Although the Chukchi herders who were brought from Siberia proved to be unsatisfactory and were soon replaced by Norwegian Laplanders, the Siberians were responsible for the introduction of certain items of material culture associated with reindeer transport that had been previously unknown in mainland Alaska. In Alaska, dogs had been the only animals used by Eskimos to pull sleds, and although the introduced reindeer had originally been perceived as a food source, it was only natural that the Chukchi would stress the value of these animals for transport, since this type of use was important to them in their Siberian homeland.

The collection of Eskimo material culture made by Jackson contains two Siberian-style sleds, a reindeer collar, and three whips specifically associated with reindeer transport. It is possible that Jackson obtained these articles in Siberia himself or that they were brought from there by Chukchi herders; but it is more likely that the items were made in Alaska by Eskimos who modeled them after Siberian prototypes. In any event, they closely resemble reindeer equipment used by Eskimos on St. Lawrence Island in Bering Strait and by Eskimos and Chukchi on the adjacent Siberian coast.

The first sled (cat. no. 13122), top photo, opposite,is about 6½ feet long, 17 inches wide, and weighs slightly over 20 pounds. The wooden runners, curving up toward the front, are fastened to narrower strips which curve over and are spliced to short sections; these, in turn, are lashed to parallel pieces forming the sides of the bed. The bed itself is formed by two long pieces of wood which run parallel to the side pieces and five short crosspieces lashed at right angles to them at approximately one-foot intervals. Under each crosspiece is a curved antler stanchion lashed to the bed and the runners. Further support is provided on each side by slanting pieces which extend from the second stanchion (from the front) to the runners between the third and fourth stanchions. The bed is about half the length of the sled Vertical wooden stanchions are on each side between the first and second antler stanchions. For additional support, lashings extend from this point to the runners both in front and behind. At the rear of the sled, a curved piece of wood arches from one side of the back stanchion to the same place on the opposite side. On the left side a curved support piece—actually two pieces spliced—extends from the runner be-



Siberian-style Alaskan Eskimo sleds (above #13122, below #13123). N108462, N108460

Late 19th-century drawing by unknown Bering Strait Eskimo. Courtesy Smithsonian Institution, National Anthropological Archives.

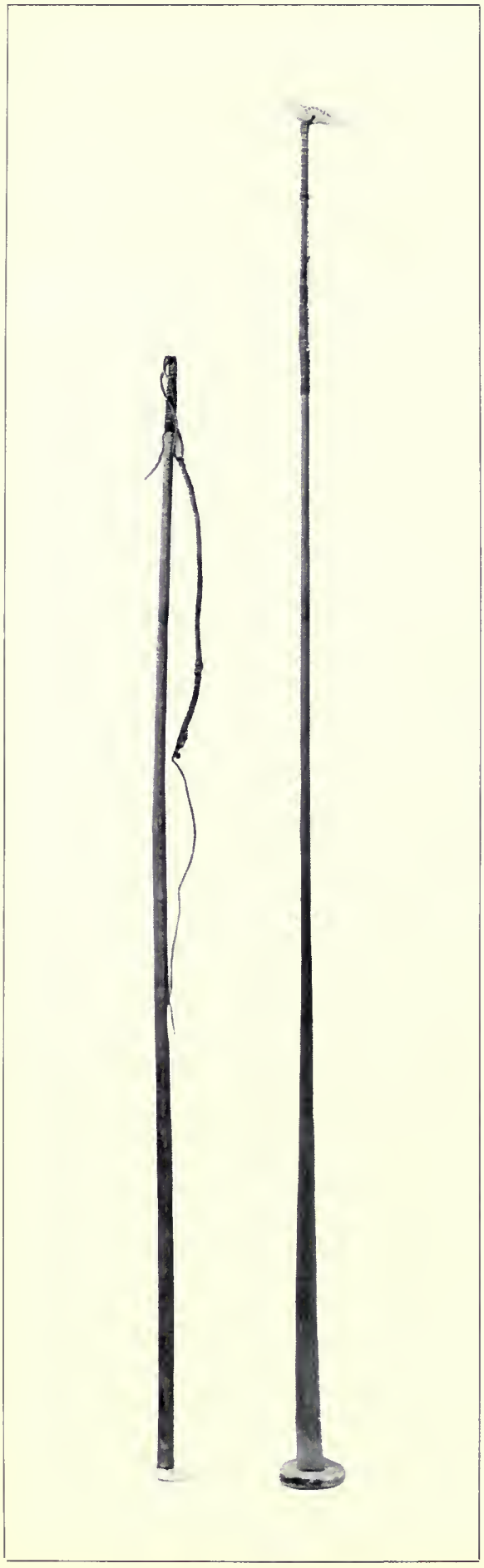
Above, left: reindeer collar (#19360, N108251); above right: harnessed reindeer (photo courtesy Archives and Historical Collections, the Episcopal Church); below: 19th-century drawing by Eskimo, showing harness apparently made of skin or leather (photo courtesy Smithsonian Institution, National Anthropological Archives).

tween the fourth and fifth stanchions to the side of the curved back piece. The sled shoes are rectangular sections of whale rib with paired lashing holes connected by a lashing slot. All lashings and splices are with strips of untanned sealskin.

The second sled (cat. no. 13123), second photo from top, previous page, is about 20 inches longer than the first and about the same width. Although constructed in much the same manner, it is somewhat heavier and more solidly built. Construction of the bed is similar except that there are seven crosspieces and a corresponding number of curved antler stanchions. The runners extend to within a foot of the front, where they are spliced to curved pieces which extend over and are spliced to the sides of the bed just in front of the first stanchion. There is a stabilizing crosspiece which joins the two runners at the front of the sled. Slanting reinforcements for the stanchions extend on either side from the bed at a point just beyond the second stanchion to the runners between the fifth and sixth stanchions. All lashings and splices are made with tanned strips of sealskin. There is no upright curved piece at the back of this sled and one-piece whale bone shoes are lashed to the runners.

A sled similar to the above two being pulled by a pair of reindeer is shown in a late 19th-century drawing on the previous page by an unknown Bering Strait Eskimo. Flat-bedded Alaskan Eskimo sleds, also used with reindeer, were probably more suitable for heavy loads.

The Jackson collection contains a single reindeer collar (cat. no. 19360), above, which consists of three curved pieces rather carefully fashioned of spruce driftwood. All are approximately 36 inches in length; the harness fragments adhering to them are strips of tanned sealskin with the hair removed. All pieces are slightly countersunk on one side in the area of harness slots, and the side pieces are decorated with engraved half circles and parallel lines.



Reindeer whips (#13148 at left, #13146 at right). N108689

The side pieces of such a collar fit rather far back on the reindeer's neck and were tied together at the notches on the bottom (see reindeer photo, opposite). The top piece fits across the animal's back in the same area. Strips of harness extend from both sides and the top. A late 19th-century Eskimo drawing (opposite page, bottom) shows a complete reindeer harness apparently made entirely of skin or commercially tanned leather, rather than with a wooden collar like Field Museum's specimen.

Dimensions of the collar just described indicate that domestic reindeer were small animals. They seldom grew to more than three feet at the shoulders and were usually less than two-thirds the size of their wild caribou relatives. The small stature of reindeer is clearly illustrated in the photo on page 23, which shows two of the animals with three Eskimo herders near Port Clarence on Seward Peninsula. The remainder of a herd can be seen in the background.

There are three reindeer whips in the Jackson collection, two of which are shown at left. The whip on the right in the photo (cat. no. 13146) is 55 inches long and consists of a wood shaft which widens slightly at the proximal end, where a round antler ferule is attached. The length has been increased by means of a much shorter piece of wood spliced to the distal end with sinew. A small ivory knob fits over the distal tip and is attached with sinew. The harnessed reindeer was encouraged to move faster by simply being touched with this knob. The driver in the drawing on page 25 holds a similar whip. The left whip shown here (cat. no. 13148)—95 inches long—has an ivory ferule at the proximal end of the shaft; at the distal end a sealskin cracker is attached with braided sinew.

Items of Siberian material culture like those described here are among the few tangible remains of an early government program to promote the welfare of Alaskan Eskimos. Although domestic reindeer owned by Eskimos lasted in some areas of Alaska as late as the mid-1940s, the animals eventually disappeared and the herding program must be regarded as a failure. Reasons for this failure were multiple; among them were poor herding techniques, predation, disease, marketing problems, and vacillating government policies.

Most important, perhaps, was the fact that the nomadic routine required for good close herding was scarcely compatible with the sedentary pattern of village life traditional to most Alaskan Eskimos. Failure on the part of the government to appreciate this incompatibility was probably the single most important reason for the eventual complete failure of the reindeer herding program. □

Arctic Housing—Eskimo Style

by DANIEL J. JOYCE

Staff Member of the Maritime Peoples of the Arctic and Northwest Coast Project

Cutaway replica of Alaskan Eskimo house in Gallery III, Hall 10. Photo by Ron Testa.

Gallery III ("Village and Society") of Hall 10, where the new exhibit, "Maritime Peoples of the Arctic and Northwest Coast," was installed in April, features a cutaway full-scale replica of an Eskimo* house of western Alaska. The house is furnished with items of daily life that were typical at the turn of the century.

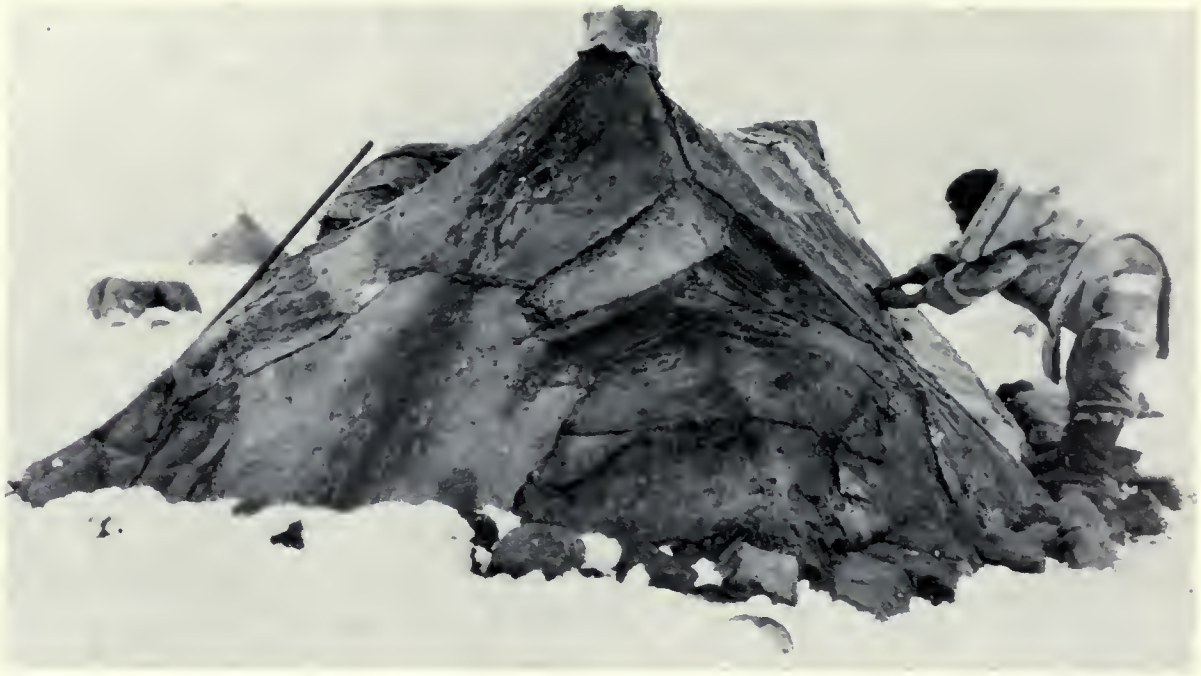
In the soft glow of firelight during the long winter nights, family members lounged about in such a dwelling, talking of everyday affairs in their remote corner of the world. For them, this was the only world that mattered. They stretched out on sleeping platforms, naked under their animal-hide covers. To them, the cool temperatures were comfortable. In the half-light, they saw only walls of driftwood and whalebone darkened with soot. Through the smokehole in the ceiling, they may have caught glimpses of the northern lights.

The tiny dwelling was partly underground; a passageway, several feet long, led from the entrance to the house interior. A drop of a few feet in the passageway floor level trapped incoming cold air (which is heavier) before it could reach the main living area. Outside, the house was covered with layers of sod, which also helped keep out the cold. The house was thus

Anthropologists place Eskimos, on the basis of geography, in three groups: Alaskan and Siberian, Central (Canadian), and Greenland. As used here, the term Eskimo designates all native Arctic people. The Eskimos of the central Canadian Arctic prefer to be called Inuit, *meaning "real people". The Algonkian word* eskimo *("raw flesh eaters") is the only term that refers to all Arctic peoples as a whole. There is no native word that refers to all the people of the Arctic from Siberia to Greenland. The term Eskimo is used here because of its familiarity to the general readership.*

Eskimos of the central Arctic live in temporary igloos. Photo courtesy Smithsonian Institution.

Chief reindeer herder at Point Hope, Alaska, with his family outside semisubterranean house. Note the use of sod blocks. Courtesy the Archives and Historical Collections, the Episcopal Church.



Eskimo woman mends sealskin tent. Courtesy Smithsonian Institution National Anthropological Archives.

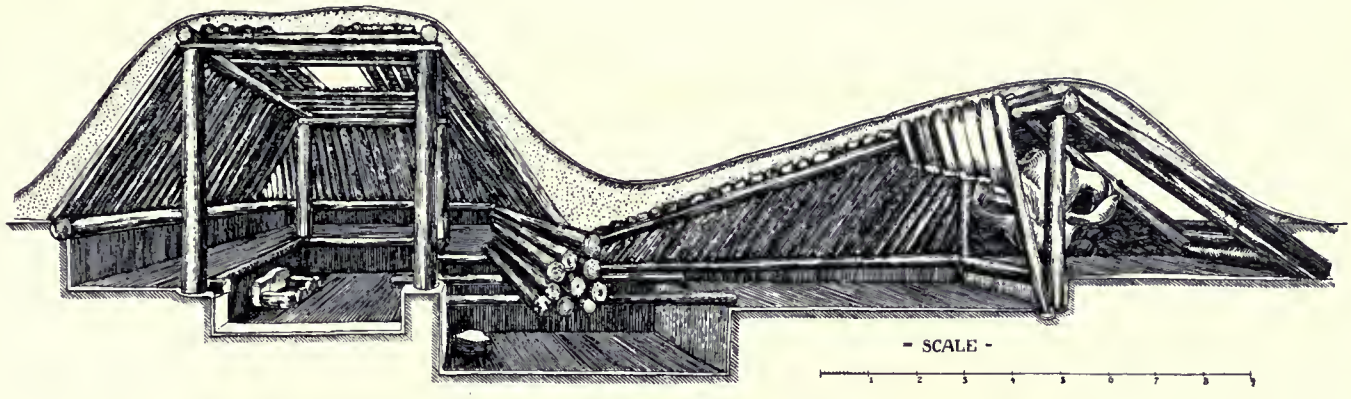
comfortably insulated against the bitter weather.

It was situated among several other houses on a hill near the Bering Sea. The nearest houses were those occupied by relatives within the large extended family. Near the center of the village was the somewhat larger *kashgee*, or *kajiji*, used for ceremonies.

Next to each house were racks for drying fish and meat, raised caches for storage, and racks for boats and sledges. From the hill, the villagers could scan the area for the game essential to their survival. They were also able to observe from this vantage point any hostile persons when still at a distance. These people were fishermen, as are the Eskimos of today; but they also hunted and continue to hunt land and sea animals. Their struggle for survival was a difficult one, with the threat of starvation never far off.

The central concern of Eskimos, wherever they may live, is the hunt and the struggle for survival. Most Eskimos live on the tundra, with its vast, rock-strewn hills. Vegetation here consists of little more than moss, lichen, and low shrub. During the brief summer, the topsoil thaws down to the permafrost, but the meltwater remains, resulting in a marshy, mosquito-infested area, where walking can be difficult if not treacherous. In the winter it is frozen solid and snow covered. In this environment, the Eskimo has developed a material culture using only ice, snow, dirt, animal skins, and bone. The bodies of animals provide not just food, but clothing, tents, tools, utensils, weapons, lamp oil, and ornaments.

Eskimo village at Point Hope, Alaska, in the early 1880s. Whalebone, stone, and driftwood were used in the construction of these semisubterranean houses. Note the drying racks and barrels. On the left is a tent. Courtesy New Bedford Whaling Museum, New Bedford, Mass.



Drawing of semi-subterranean Eskimo house on Nunivak Island, used as basis for Field Museum's Eskimo house replica. From Archaeology of St. Lawrence Island, Alaska, *by H.B. Collins, Jr. (1937).*

Eskimos of the central Arctic, unlike those of Alaska, live in temporary villages. They spend their winters in large groups on the ice, where hunting is better; and there they live in igloos. In May, when the ice of the igloos begins to melt, the roof is replaced with seal skin; the walls, made of snow blocks, are left intact. Summer villages, with fewer Eskimos, consist of tipi-shaped tents made up of double layers of seal skin. Sixty or more skins may be used to make a large tent. In the fall, when it is still too warm for building igloos, they make only the walls of their houses with blocks of lake ice; the roof is covered with seal skin.

Greenland Eskimos make block-shaped houses of stone and turf; the windows are covered with translucent gut. This type of construction may be attributable to the influence of Norse settlers arriving on the island as early as A.D. 900 or to Danish colonists, who came in 1721.

The coming of explorers, traders, and whalers affected the style of Eskimo life, but the changes occurred gradually. Many Eskimos continue to live by the hunt today, but this activity has greatly changed since the introduction of the repeating rifle. With this new ability to kill game quickly and at much greater distances, the old technology of the hunt became obsolete. Other twentieth-century changes included the type of dwelling: many Alaskan Eskimos now live in frame buildings constructed from milled lumber, though tents and igloos are still to be seen. □

Members of the Department of Exhibition who constructed and furnished the Eskimo House in Hall 10 were Mark Staff Brandl, Barbara Burkhardt, Raoul Deal, Kathryn Field, Jeff Hoke, Mitch Kane, Ed Kestler, Tom Lucas, Marty Matin, Dan Oppenheimer, and the author. James VanStone, curator of North American archaeology and ethnology, was consultant.

Kaniagmiut house near the Naknek River, Alaska, about 1890. A cache is at left and the house is at right. Evidences of enculturation may be seen: wash tubs, white clothing, metal can, and chimney. Courtesy Smithsonian Institution National Anthropological Archives.

FIELD MUSEUM TOURS

Come with Us to Kenya!

Field Museum Tour for Members

September 11-30
Tour Price: $3,195

per person, double occupancy
single supplement: $430

optional extension to the Seychelles Islands: $1,135 additional

Itinerary

Sept. 11: Depart Chicago via British Airways for London.

Sept. 12: Depart London in the evening via British Airways for Nairobi, Kenya.

Sept. 13: Nairobi. Early morning arrival in Nairobi, where you will be met and taken to the luxurious Norfolk Hotel. The rest of the day will be at leisure to relax, sleep, swim, or wander around the shops.

Sept. 14: Mountain National Parks. Today you are off on safari, driving past estates and plantations to one of Kenya's gracious up-country hotels, the Outspan. Enjoy a buffet lunch here; this afternoon continue into the Mountain National Parks—a deeply forested area. Overnight will be at Mountain Lodge, a "tree house" sitting high above a lighted waterhole where you watch the game.

Sept. 15: Samburu Game Reserve. Leaving the park, continue along the valley and the slopes of Mt. Kenya, descending into rugged Northern Province. Pass through the town of Isiolo where your vehicle will be surrounded by smiling Kenyans holding out wares. Proceed to Samburu Game Reserve and view game as you drive to the lovely Samburu Lodge. Later in the day, a game drive.

Sept. 16: Samburu Game Reserve. A full day of viewing giraffe, zebra, and gerenuk. Samburu is also a very good park for elephant and leopard. Evening at the lodge.

Sept. 17: Mt. Kenya. After breakfast, drive to Mount Kenya Safari Club. Spend a restful afternoon at this resort with its magnificent gardens situated under Mt. Kenya.

Sept. 18: Mt. Kenya. Taking a picnic lunch, there will be a full day visit to a ranch for a rare opportunity to view game on foot, or you may wish to stay behind to enjoy the club's tennis, swimming, horseback riding, and trout fishing.

Sept. 19: Lake Naivasha. After breakfast, drive towards Lake Naivasha. The bird life is spectacular. In the afternoon you can swim in the pool or just relax.

Sept. 20: Masai Mara Game Reserve. This morning you will drive through the town of Narok, the main Masai town where you may wish to buy various wares. Proceed on to Masai Mara Game Reserve and your luxury camp, Kichwa Tembo. You will have an afternoon game drive, followed by cocktails around the campfire and a gourmet dinner.

Sept. 21: Masai Mara Game Reserve. A full day of game viewing. Game here is limitless. The lion population is very large. Also elephant, rhino, giraffe, hyena, cape buffalo, hartebeeste, topi, impala, gazelle, and bird life. Explore the river area, seeing crocodile or hippos. There is also the opportunity of a walking safari—where you will track animals on foot. After a long day in the bush, enjoy drinks around the campfire and dine in an elegance quite unexpected in the wilderness.

Sept. 22: Nairobi. After breakfast drive back to Nairobi, stopping en route for lunch at the home of Mrs. Mitchell, a life-long resident of Kenya, whose family began the first tea plantation in Kenya in the 1920s.

Arrival back in Nairobi will be in the mid-afternoon and will be at leisure for your own activities.

Sept. 23: Amboseli National Park. Off on safari again, heading towards Amboseli National Park, famous for its big game and superb view of Mt. Kilimanjaro. Following lunch at the lodge, spend the afternoon game viewing.

Sept. 24: Amboseli National Park. Following early breakfast, a full day of game viewing, taking a picnic lunch with you.

Sept. 25: Tsavo National Park. This morning continue further south to Tsavo National Park. View game before arriving at Kilaguni Lodge for lunch. From the lodge watch the game wander in to drink at the waterhole. This afternoon go out in search of the great herds of elephant. You will also visit at Mzima Springs where you will view from an underground tank hippo, crocodile and fish. Late this afternoon arrive at Ngulia Lodge.

Sept. 26: Mombasa. This morning drive to the luxurious Taita Hills Lodge, set among beautiful gardens. Continue southwards to Mombasa and the Two Fishes Hotel. Here the balance of the day will be at leisure.

Sept. 27: Mombasa. A full day excursion to Shimba Hills National Reserve, a forested plateau. Later this afternoon return to the comforts of your hotel.

Sept. 28: Mombasa. A full day at leisure to relax on the beach, swim in the Indian Ocean, or just soak up the tropical sun. There is also the opportunity to hire a boat and search for fish such as marlin, sailfish and shark. If your preference is the underwater world, you can go diving off the reef. This evening wander down to a local hotel for a cocktail or relax in the quiet of the Leopard Beach Hotel.

Sept. 29: Nairobi. Morning flight back to Nairobi, where day rooms have been reserved at the Norfolk Hotel for your convenience. The balance of the day will be at leisure for shopping and sightseeing. Late evening transfer to the airport for flight to London.

Sept. 30: Chicago. Arrive London early this morning and transfer to day rooms at the Sheraton Skyline Hotel. Your Chicago flight will leave early this afternoon, arriving in Chicago later the same day.

An optional excursion to the Seychelles Islands is available upon request. Operation of this extension is contingent on the enrollment of four or more people. The Seychelles, in the heart of the Indian Ocean, are acclaimed as one of the loveliest and most unspoiled beauty spots. They offer an atmosphere of timelessness and tranquility. Please let us know if you wish to have further information.

Audrey Faden, a native of Kenya, will be our guest lecturer. With her keen interest in wildlife, conservation, and plant life, she is a natural to lead our tour. Audrey served as Officer in Charge of Education at the National Museum of Kenya, Nairobi, and was instrumental in organizing Wildlife Clubs of Kenya. She served on the Field Museum volunteer staff and has done field research and general collecting of plants in Kenya.

For further information on this superb tour, please call or write Dorothy Roder, (312) 322-8862.

Squabbling California Condors Have Second Egg

The pair of California condors that accidentally lost their egg in a domestic squabble in late February (as reported in the May *Bulletin*) have laid a second egg, giving condor biologists cause for rejoicing.

Biologists of the Condor Research Center got their first look at the egg shortly after noon on April 8, when the female rolled it out of a dark corner of the nesthole into full view of an observation station a half mile distant. The egg was produced some time during the previous day, judging from the behavior of the female, and was laid in a cave about 100 yards distant from the cave the pair used for their first egg. Both sites are located in a remote mountainous region northeast of Ventura, California.

The condor pair's first egg, laid on February 14, was lost over the edge of the cliff 12 days later as the birds fought over which would sit on it. The condors, believed to be the same pair that successfully fledged a chick in 1980, also squabbled at that time over which would feed the young, but the disputes did no apparent harm.

The condor biologists are not only concerned about discord between the condor pair, but are also worried about a pair of opportunistic ravens that have already intruded into the condors' nest cave. Ravens are known predators of the eggs of other birds. Progress in the 60-day incubation of the California condor egg laid on April 7 will be closely watched by the research team.

The time between loss of the first egg and laying of the second was about 40 days, according to Noel Snyder of the U.S. Fish and Wildlife Service and John Ogden of the National Audubon Society, co-leaders of the Condor Research Center. "This is the best evidence yet obtained that the critically endangered California condor will re-nest after a nesting failure early in the breeding season," Snyder said.

Relaying after early egg loss has long been known for captive Andean condors, but whether the California species might act similarly has been a matter of conjecture. The question now appears to be resolved.

The ability of the Andean condors to re-lay after failure has enabled zoos and research institutions such as the Patuxent Wildlife Research Center to greatly increase the breeding rate of this close relative of the California condor. Andean condors, like California condors, normally lay only a single egg every other year. If an egg is removed from the nest to be hatched in an incubator, the pair can usually be expected to lay a second egg about a month later, a process called "double clutching." If the second egg is likewise removed, the parents sometimes will lay even a third egg. In this way, captive reproduction can be multiplied greatly over what pairs normally produce in the wild.

Biologists hope to be able to double and triple clutch captive California condors. Captive breeding of California condors recently received federal and state approval as an important part of the efforts to save the species from extinction. Only about 30 California condors remain in the wild, all in southern California. There is only one individual in captivity, a male bird at the Los Angeles Zoo, named Topatopa.

Snyder and Ogden emphasize the importance of the recent proof of natural double clutching to the captive breeding program. If wild pairs will re-nest after early failure, it should be possible to establish a captive population by taking wild eggs for artificial incubation without having much effect on natural wild production and without reducing the size of the wild population.

Only four other active pairs of condors have been located by the research team. One of these produced a fledgling last year and is not expected to breed this year as they are still caring for this youngster. None of the other three pairs has laid as yet, with one month to go in the egg-laying season. The research team is keeping close track of all these pairs from a safe distance.

Federal Studies of Bird and Aircraft Collisions

Like oil and water, birds and planes don't mix. When they do, the skills of the wildlife biologist and the professional airport manager are often needed to get them apart, and keep them separated.

Each year, more than 1,400 collisions between birds and aircraft occur in the United States. Although the toll in deaths and injuries is fortunately low, an estimated $20 million in damage is caused to aircraft annually.

The U.S. Fish and Wildlife Service and the Federal Aviation Administration are working on research projects that may help reduce bird strikes and improve the margin of safety for the traveling public. These studies are part of an existing agreement between the two federal agencies to step up the identification of bird hazards at airports. They range in scope from a study of bird strike hazards at airports as part of the development of prototype risk maps that could be used nationwide, to surveys of bird-tempting earthworms that emerge on rain-soaked runways at particular airports.

Bird hazards have grown since the early days of flight, as airplanes have become larger and faster and air traffic lanes more congested. Since the 1940s, when records were first kept on the death toll from bird strikes, more than 150 people have been killed in collisions blamed wholly or partly on birds.

Serious air collisions with birds most typically involve small private jets or turboprop airplanes. In September 1981, for instance, a collision between seagulls and a U.S. Air Force T-38 at Cleveland's Burke Lakefront Airport claimed the life of the commander of the military's famed Thunderbird Demonstration Team. Another death occurred last spring when a migrating common loon crashed through the windshield of an executive jet near Cincinnati, killing the co-pilot and injuring the pilot. (A four-pound bird struck by an airplane traveling at 300 mph exerts almost nine tons of force at its point of impact; at 600 mph, the force jumps to 36 tons.)

Occasionally the death toll and aircraft damage can reach even more serious proportions. A 1960 collision between a commercial airliner and a flock of starlings claimed the lives of 62 people at Boston's Logan Airport. In 1975, a plane with 129 passengers at Kennedy Airport in New York sucked a flock of seagulls into an engine on take-off. A fire broke out that consumed the plane within five minutes, although all passengers were evacuated safely.

"As long as man competes with birds for airspace, there will be the danger of collisions. The trick is to avoid having them compete for the same space at the same time and to reduce the attractiveness of airports to birds," says a Fish and Wildlife Service official. "Through the research projects that we are currently conducting, we hope to gain a much greater understanding of the natural forces that draw birds to airports, so that they can be compensated for in the design, siting, and operation of these facilities."

The service provides technical assistance to nearly 200 airports with bird problems each year. That assistance can range from solutions that temporarily disperse problem flocks of birds through the use of noisy propane cannons and shellcrackers to full biological surveys that recommend altering vegetation or drainage patterns around airports. In this latest series of research projects, however, biologists hope to learn more about the basic biological factors that draw birds to airports.

June & July at Field Museum

June 16 through July 15

New Exhibits

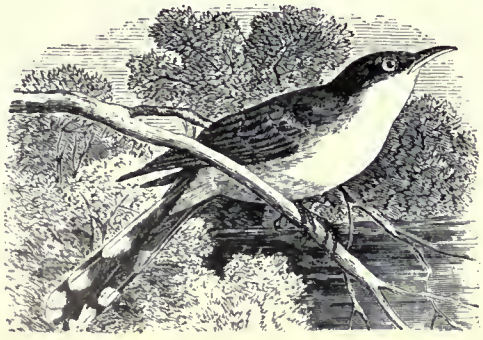
"Exhibitions, Expeditions and Expositions." This photographic essay offers the viewer a look at the construction of Field Museum's building more than 60 years ago and of some famous exhibits. It is now on display between the Anniversary Exhibit in Hall 3 and the entrance to "Maritime Peoples of the Arctic and Northwest Coast" (Hall 10). Designed by Don Emery and researched by Beverly Serrell, Exhibition, and the Field Museum Photography Department.

Continuing Exhibits

"Maritime Peoples of the Arctic and Northwest Coast." Just opened! Field Museum's new permanent exhibit compares the theatrically ornate cultures of the Pacific Northwest Coast with the austere but individualistic Eskimo societies. Their prehistoric origins, history, food-gathering, social life, spiritual beliefs, art ranging from massive totem poles to exquisite basketry—all are shown in five galleries through displays, dioramas, full-sized replicas, and films. It's an exhibit you'll return to again and again for new insights into these remarkable peoples and their triumph over the environment.

"Place for Wonder." "Touch everything!" is the motto of this mini-museum, a delight to young and old alike. Look for a new exhibit in the People's Center showcasing clothing, toys, and everyday objects from India, opening in June. Continuing exhibits include "Earthquake Charlie", a huge Alaskan polar bear; volcanic ash from Mt. St. Helens; and collections of fossils, minerals, and shells. Many labels also in braille. Open 1-3 daily. Saturday and Sunday 10-12, 1-3.

"The Insect World." View butterflies from many parts of the world, with their brilliant turquoise, purple, orange, and red hues. Madagascar's iridescent "Less" butterfly alone displays 8 dazzling colors! Moths range in size from the "Hercules" of New Guinea, with a 10-inch wing span, to the tiny "Blackberry Borer." Rivaling the "Hercules" is the huge African "Rhinoceros beetle"—8 inches long, including 2-inch-long pincers. Main floor, outside Hall 21.



New programs

"The Art of Papermaking." Field Museum's June *Family Feature* for parents and children of all ages. Saturday's program includes a slide lecture on papermaking techniques such as coloring, sizing, pressing, and drying; and the opportunity for participants to make their own sheet of paper. On Sunday, the slide program will be followed by a film on Japanese papermaking. Lecture Hall 1. Saturday and Sunday, June 19 and 20 at 2 p.m.

"Tales from the Smokehouse." The Théâtre Sans Fil (No Strings Puppet Theatre) from Montreal uses giant puppets (6 to 12 feet tall) to retell the legends of Canada's Indians. The stories are told by tribal elders to the younger men as they gather in a smokehouse to purify their souls. More than 40 stringless puppets in costumes inspired by Northwest Coast designs are used to act out two stories. The first, "Blue Sky Takes a Wife", is an Ojibway love story; the second, "The White Raven", explains the Tsimshian view of creation. Members $3; nonmembers, $4. James Simpson Theatre. Saturday and Sunday, June 26 and 27 at 2 p.m.

"In Search of Dinosaurs." Take a Summer Journey among Field Museum's dinosaur specimens! Discover the basic facts about dinosaurs and their closest relatives. For a self-guiding tour, free *Journey* pamphlets are available at Museum entrances.

Summer Fun Workshops for Young People. Field Museum's exhibits will come alive for the young people ages 4 to 15 who participate in one of the more than 80 workshops

offered this summer. These workshops take place Monday through Saturday and are taught by Field Museum staff, Chicago area teachers, and visiting artists. Children can, for instance, press flowers, make flutes, write in Chinese, or make a casting of a giant fossil tooth. Workshops include "Bug Hunt", "Inside the Volcano", "Northwest Coast Masks," "Whales," "Dragons and Dinosaurs," "Summer Sprouts," and many more. For more information and to receive a brochure, call (312) 322-8854. July 6-August 2.

WEEKEND DISCOVERY PROGRAMS. These weekend programs of tours, films, and slide presentations will provide the springboard for a better understanding of natural history. Check "Weekend Sheet" at Museum entrances for additional programs and locations.

June 19 at 11:30 a.m.: "Ancient Egypt" tour.
at 2 p.m.: "Malvina Hoffman" film and slide lecture.
June 26 at 1 p.m.: "Tibet Today" film program.
at 2 p.m.: "Tibet" tour.
July 3 at 2:30 p.m.: "Indians of North America" tour.
July 10 at 3:00 p.m.: "Life in Ancient Egypt" tour.
July 11 at 2:00 p.m.: "Northwest Coast Indians: Cedar Carvings" tour.

Continuing Programs

MUSEUM HOURS. Field Museum instituted new hours beginning May 1. The Museum is now open daily, including Saturdays and Sundays, from 9 a.m. to 5 p.m., year-round. There will be no more late Friday hours. The *free day* is now Thursday, instead of Friday. The Museum is closed on Thanksgiving Day, Christmas, and New Year's Day.

LIBRARY HOURS. During June and July the Museum Library is open weekdays from 9 a.m. to 4 p.m. It will be closed on Monday, July 5. To visit the Library, obtain a pass at the reception desk, main floor.

VOLUNTEER OPPORTUNITIES. Individuals with scientific interests and backgrounds are needed to work in various Museum departments. Contact the Volunteer Coordinator, 922-9410.

MUSEUM TELEPHONE: (312) 922-9410

Fieldiana: 1981 Titles

Fieldiana is a continuing series of scientific papers and monographs in the disciplines of anthropology, botany, zoology, and geology; the series is intended primarily for exchange-distribution to museums, libraries, and universities, but all titles are also available for public purchase.

The following titles, published in 1981, may be ordered from the Division of Publications. Members are entitled to a 10 percent discount. Publication number should accompany order. A catalog of all available *Fieldiana* titles is available on request. (Please specify discipline: anthropology, botany, geology, or zoology.)

Fieldiana: Anthropology

1326. "An analysis of Santa Maria Urn Painting and Its Cultural Implications", by Ronald L. Weber. New Series Number 2. $3.75.

1327. "Catalogue of Chinese Rubbings from Field Museum", researched by Hoshien Tchen and M. Kenneth Starr, prepared by Alice K. Schneider, photographed by Herta Newton and Field Museum Division of Photography, edited by Hartmut Walravens. New Series Number 3. $67.50.

1328. "Athapaskan Clothing and Related Objects in the Collections of Field Museum of Natural History", By James W. VanStone. New Series Number 4. $7.00.

Fieldiana: Botany

1317. "Ferns and Fern Allies of Guatemala —Part II Polypodiaceae", by Robert G. Stolze, the Genus Elaphogiossum by John T. Mickel, the Genus Thelypteris by Alan R. Smith. New Series Number 6. $23.50.

1319. "Flora of Peru—Family Compositae Part II, Tribe Anthemideae", by J. Francis MacBride and Collaborators and Michael O. Dillon. New Series Number 7. $2.75.

1322. "Five New Species of Brunfelsia from South America (Solanaceae)", by Timothy Plowman. New Series Number 8. $2.50.

Fieldiana: Geology

1315. "The Mammalian Fauna of Madura Cave, Western Australia, Part IV", by Ernest L. Lundelius, Jr. and William D. Turnbull. New Series Number 6. $7.50.

1318. "Review of the Hathlyacyninae, an Extinct Subfamily of South American 'Dog-like' Marsupials", by Larry G. Marshall. New Series Number 7. $11.75.

1320. "The Families and Genera of Marsupialia", by Larry G. Marshall. New Series Number 8. $6.75.

1321. "Geology and Geochronology of the Mammal-bearing Tertiary of the Valle de Santa Maria and Rio Corral Quemado, Catamarca Province, Argentina", by Larry G. Marshall and Bryan Patterson. New Series Number 9. $8.00.

1323. "Introduction and Index to Fieldiana: Geology Volume 33", by Eugene S. Richardson, Jr. and William D. Turnbull. Volume 33, Number 31. No charge.

Fieldiana: Zoology

1316. "A Multivariate Study of the Family Molossidae (Mammalia, Chiroptera): Morphology, Ecology, Evolution", by Patricia Waring Freeman. New Series Number 7. $13.25.

1324. "The Blennioid Fishes of Belize and Honduras, Central America, with Comments on their Systematics, Ecology, and Distribution (Blennidae, Chaenopsidae, Labrisomidae, Tripterygiidae)", by David W. Greenfield and Robert Karl Johnson. New Series Number 8. $11.50.

1325. "Taxonomy and Evolution of the Sinica Group of Macaques: 2. Species and Subspecies Accounts of the Indian Bonnet Macaque, Macaca Radiata", by Jack Fooden. New Series Number 9. $5.50.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

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COVER

Wooden santo: *San Isidro, or St. Isidore, the patron of good harvests. Polychrome over this gesso on hardwood. 18th-19th century. 54 cm. Lent by Luis Ma Araneta, Manila. One of the 420 objects displayed in the new exhibit, "The People and Art of the Philippines," on view in Hall 26 from July 17 through December 31. Photo by Ron Testa.*

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The People and Art of the Philippines

Exhibit Opens July 17

Members' Preview July 16

Woven cotton headcloth from Sulu Archipelago; Samal or Yakan. 98 cm. Collection of Field Museum. Gift of Dr. Alexander Spoehr. #257291.

This impressive assemblage of 420 artifacts, on view until December 31, is the largest special exhibition of traditional Filipino art to be held anywhere since 1905, with loans from 16 museums and 13 private collections in the United States, Europe, and the Philippines. The objects were selected to give a comprehensive view of the culture of this former Spanish and then American colony, now a major Southeast Asian nation. Special emphasis is on prehistoric ceramics and gold, Catholic arts of Spanish colonial times, wood sculpture of the northern Philippines, and the extraordinary textiles of the southern Philippines. On view in Hall 26. Members' preview: Friday, July 16 from 1 to 9 p.m.

FIELD MUSEUM AND THE PHILIPPINES

by BENNET BRONSON
Associate Curator, Asian Archaeology and Ethnology

Colonialism and The Cummings Expedition

The Museum's first serious involvement with the Philippines came as an indirect result of the great St. Louis World Exposition of 1904, where objects and peoples from the colonies of several nations were on display. As the Philippines had only recently become an American colony, having been acquired during the Spanish-American War of 1898, and as America had no other colonies, the extensive Philippine exhibits at St. Louis created both a sensation and an awareness of a problem.

The sensation came from the rich variety of cultures that existed in the new colony, ranging from those of headhunters to those of sophisticated city dwellers. The handsome and magnificently costumed Bagobos impressed most visitors, as did an exhibit of Philippine export crafts and industries, and a contingent of notably fierce-looking Bontocs. Few visitors seem to have been uncomfortable at the zoo-like aspects of having colonial subjects on display. Such things were customary at world's fairs in those days, and besides, many of the colonial subjects are reported to have enjoyed the experience.

George Dorsey. N108072

The problem that bothered thoughtful visitors was that America had obviously bitten off more than it could easily, or should, chew. Many agreed with Mark Twain that a free nation should not have colonies in the first place. Others were uncomfortable about a point the exposition brought home with special force: our sheer ignorance about what we had gotten into. Compared with the English or Dutch, Americans knew nothing about running colonies, and compared with most colonies of most European powers, the Philippines were poorly known in the first place. The Spanish had controlled only the central three-fifths of the country. Parts of the northern and southern ends of the Philippines were still as much *terra incognita* as the basins of the Congo and Amazon.

It may have been because of this that, in late 1905, a grain merchant from Clifton, Illinois, Robert F. Cummings, approached the Museum with a startling proposition: he was willing to fund extensive anthropological research in the Philippines with two apparent provisions, that the people of Illinois should benefit and that the work should begin immediately.

The Museum was definitely interested. It had just failed in an attempt to purchase some of the Philippine material exhibited at St. Louis (which had already been promised to the Smithsonian) and was pleased to find another way of building up its collections. Several months of discussions between Cummings and George Dorsey, chief curator of the Anthropology Department then followed. Agreement was abruptly reached in March, 1906. Cummings pledged no less than $20,000 to cover all expenses of fieldwork. In return, the Museum seems to have guaranteed to bear the costs of setting up a large permanent Philippine exhibition.

After that, things moved quickly. S. C.

S.C. Simms. N78430

Simms (then assistant curator of ethnology) was already on a ship to Manila by the end of April, and within the next three years no fewer than four other Field Museum anthropologists departed for the Philippines. Simms was there from June through December 1906 and again from April 1909 to January 1910. Faye Cooper Cole stayed from January 1907 to June 1908 and from October 1909 to January 1911; Laura Benedict from August 1906 to February 1908; William Jones from September 1907 to March 1909 (when he was killed before his work was completed); and Dorsey himself for a flying visit in December 1908. By the end of 1911, when all objects, photographs, recordings, and notes were back in Chicago, the Museum found itself with not only an unparalleled collection but a treasure trove of written data that has thus far resulted in at least eight books and numerous articles.

The next few pages present excerpts from field letters that did not appear in any of those books or articles. These have been chosen partly for their anthropological and historical interest but also partly because of the (sometimes unflattering) light they shed on the attitudes and problems of scientists working in the field.

Letters from the field

SIMMS TO DORSEY, SEPTEMBER 7, 1906

S. C. Simms, more museologist than fieldworker, was thrown into the breach as the only person in the Anthropology Department who could be spared from his Chicago duties at the time the Cummings agreement was finalized. He was sent out almost immediately, without time to learn much about either the Philippines or its cultures. Considering the disadvantages under which he worked, he made a passable collection but, as this and many of his other letters show, he did not enjoy the experience. Here Simms is writing from comfortable surroundings in the then newly established resort town of Baguio:

My dear Dorsey:
No one regrets more than I in having to abandon

Tinguian cargadores in Bangued, Abra Province, Luzon. Photo by Charles Martin, ca. 1905. N28788

Embroidered men's jacket of abaca *cloth, from Mindanao; Bila-an. 53 cm. Collection of Field Museum. #129374.*

my collecting in Benguet Prov.[1]—at least until I am able to be about. Nothing serious but it came mighty near it and I don't care for a repetition of it.

The Aguo river, which Prof. Wooster warned[2] me about did the trick. I reached the bank of the Aguo Sunday morning after 4 hours of hiking to find the river up a bit.

Could not get my personal cargadores[3] to cross it then. River kept rising with increased rainfall. Did not prepare for chow as was told was not necessary for I could get rice, camotes, etc. along trail. Two of the cargadores were dispatched to find a house but could not. So under the shelter of a huge rock on a very rocky bed we stayed while it rained and rained—and until the following morning without a single mouthful to eat—29 hours since last meal. Built fires and attracted attention to natives on other side of river who came on Monday to river edge. After river had fallen slightly and plunged in way up stream and landed on my side. After many gestures they understood to carry cargo, cargadores and myself over. Every thing and person but myself and horse got over without accident. I was it. Two natives leading horse with me in saddle to give it weight—and just in midstream the brute stumbled, fell, went under and me with him. Downstream we went at a very lively pace, finally landing against a large boulder with horse against me and my back and shoulder testify that I hit something pretty hard and for the poor brute he received a gash over his eye. As soon as we could get the horse out—and it was a hard job—I went as fast as possible to Bangras[4] where I had something to eat and a change of clothes—proceeded then to Caboyan where I slept and left next morning for Ambuklao trying to get to Baguio where there is a sanitorium. Bruises and wrenches hurting

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1. He was collecting among the Kankanay and Ibaloi, ethnic groups inhabiting the area around and near Baguio.

2. Dean C. Worcester, who often appears in these letters, was then America's leading expert on the minority peoples of the Philippines. He had recently finished serving on the Presidium-like Taft Committee and held the powerful post of colonial secretary of the interior. Simms misspells his name deliberately; the two men were not fond of each other.

3. Spanish for "porters" or "bearers."

4. Several of the place names in Simm's account cannot be identified.

like———body [?]. Had to cross the same (Aguo) river at Ambukeo by being pulled across on a high stretched carabao hide rope of slender diameter—seated in carabao yoke—however I got across—likewise cargo and cargadores the same way—had chow at Ambukeo—then for Baguio and while on top of mountain near Ambukeo typhoon drove me to shelter in native house near Tabyo—4 hours from Baguio.

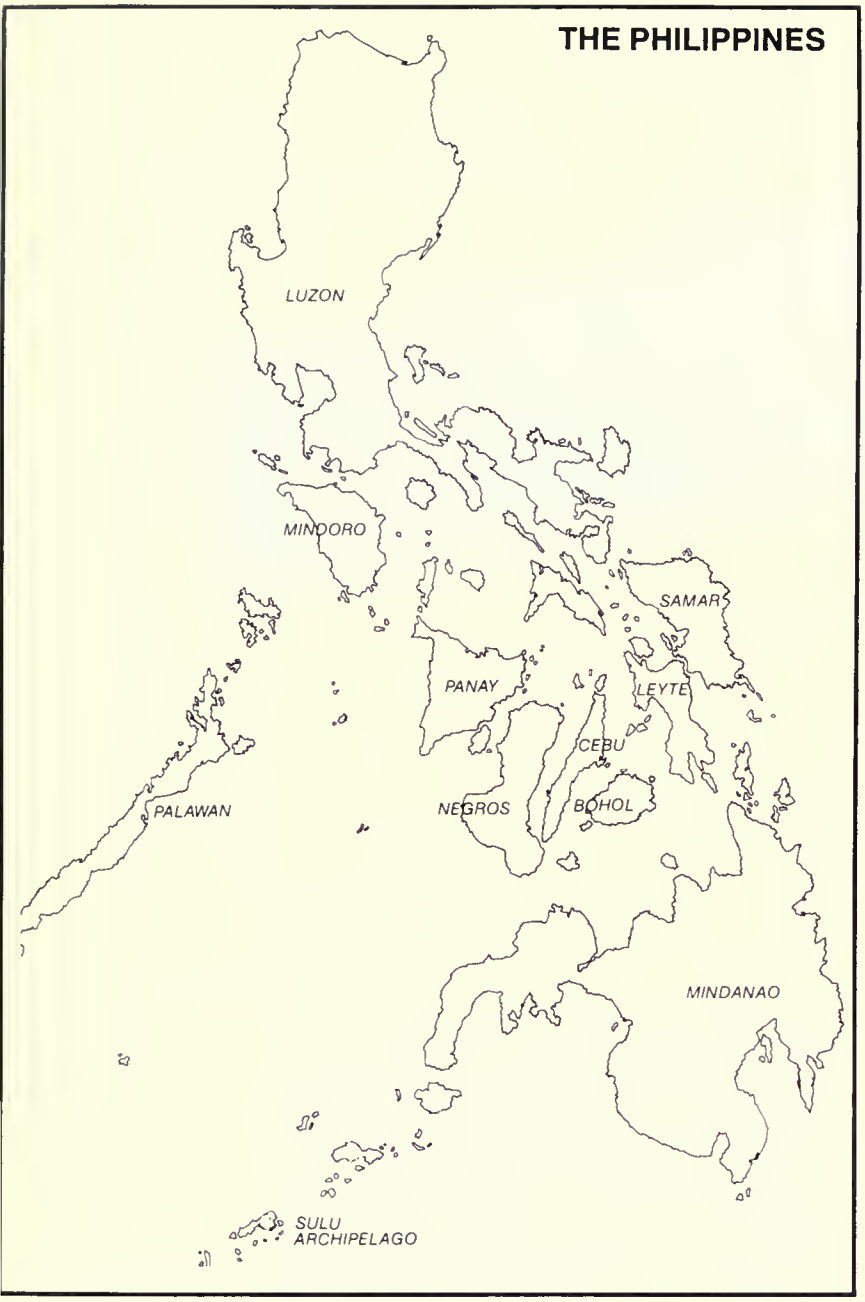
Been here but a day nursing.

Typhoon continues at rate of 1 in. rainfall one hour and it will take days and days for the trails to dry and my injuries to improve.

DORSEY TO COLE, JUNE 3, 1907

George Dorsey kept close track of his fieldworkers from Chicago. While his rather frank criticisms of Simms seem a bit harsh, they reveal the writer as a good anthropologist. He not only gives generally sensible advice but has a surprisingly modern attitude toward the goals of fieldwork.

...I have commented on Simms collection before. I may say to you confidentially again that it is very unsatisfactory from many points of view; especially it represents nothing completely, no art, no industry, no ceremonies; represents odds and ends which were found in site, but which have no particular coherence. Simms is a good judge of good material, and of course his specimens all are of high excellence individually, but they represent links rather than a chain which exhibits a story. The collection represents no processes; it is quite devoid of games, traps, snares; has no foods, nothing illustrating the methods of preparation of foods; and is of course very weak in all the little ephemeral things which are in themselves trite and trivial, but which are essential to illustrate the culture. We want collections which will illustrate completely all the different groups of people which you encounter. Do your work deliberately; be in no hurry; do it thoroughly, completely and well. I have no doubt of your ability, and no fear of your failing. It would possibly be more to the Museum's interest for you to keep moving from one place to another, rapidly amassing material, but this would be of no great credit to you. It is much more to your credit, more to our honor and glory if you do nothing else than to cover one distinctive group of peoples, doing them thoroughly and well.



Upper right: Faye Cooper Cole. N44788

COLE TO DORSEY, APRIL 22, 1907

Faye Cooper Cole was younger, better trained, and much more field-oriented than Simms. He also had more local background, having just completed several months' study in Berlin, than a leading center for Philippine studies. In this letter, written from Bangued in the northwestern corner of Luzon, he is describing part of a recent journey in Tinguian country, seeking a little known subtribe called "Alzados" by their neighbors.

Cole seems a good deal more cheerful than Simms about the rigors of the field.

. . .At last, we reached the summit, and after a rather more rapid descent, came to the first rice fields where about fifty Alzados,[1] armed with shields, spears, and axes, awaited us. It was a mighty interesting sight but one which made my cargadores hunt for padlocks to be sure that their heads were fastened on securely. When they learned our mission, the whole party fell in behind and accompanied us to the first rancheria,[2] Am-ti, where we had a big feast of venison and eels. After Amti, we spent two days at Danoc, and were always given the fat of a lean land. Leaving Danoc, I started down the Ikmin River to Duamon, also spelled Doa-angan, a town no white man had ever seen, and the reason for this was soon evident; the river in places ran through a cañon not fifty yards wide and cut through solid granite; the "trail" ran above the river ten or fifteen feet, and in few places could you put your feet together. The smooth rocks offered no hand hold, and a slip meant at least a bath in the rushing waters and perhaps broken bones. With ordinary shoes, the trip could not be made, but I was provided with rope sole pragatos and got along nicely. Until near the village, we had crossed the river when necessary on two bamboo poles which served as bridges, but just at dark, we had to plunge in and ford where the water was waist deep and so swift as almost to carry us away. We were two days with these people and while there accidentally saw an interesting ceremony[3] which I have since learned is also practiced by the Tinguianes. The plunge in the river resulted in wet clothes which we hung out to dry over night. In the morning, a pair of trousers was missing, and diligent search failed to disclose the thief. After a consultation, the old men brought out a rice mortar

1. Cole later concludes that the Alzados are a mixed group, partly Bontoc and partly Tinguian.
2. "Rancheria" here means a small settlement or hamlet, not a ranch.
3. Oath rituals for detecting malefactors are common in many societies. This particular ritual seems more effective in providing free beer for everyone than in restoring Cole's trousers.

Bagobo women in gala dress, Davao Province, Mindanao. Photo by Faye Cooper Cole, ca. 1910. N34859

Bagobo musicians of Davao Province, Mindanao. Photo by Faye Cooper Cole, ca. 1910. N21460

on which they put a dish containing basi and a knife; they then prayed to the spirits that the thief might die, the snakes bite him, or disaster come to his fields and family. This done, they made every man, woman, and child stand before the mortar and pray to the spirits that these calamities might fall on them if they were guilty. A jar of basi[4] was then opened, and we had a drinking bout after which, they presented us with a spear and shield to make good the loss. They told me that they would soon know the thief as the guilty one would have the misfortune he had invoked, and that then he or his family must pay for the basi and the presents; if he should not be detected, the expense would be divided among the whole people.

JONES TO DORSEY, MARCH 19, 1909

William Jones was murdered by the Ilongots with him nine days after the following letter was written. One-quarter Crow Indian and brought up as an Indian in Oklahoma, Jones had been a remarkable success story, becoming in succession a cowboy, a pupil in a school for Indians, and then graduating from Andover, Harvard, and Columbia, where he became the first American Indian to get a Ph.D. in anthropology.

His frontier background and his acute love of nature seems to have eased his acclimatization in what then, as now, was one of the wildest parts of the Philip-

4. "Basi" is the rice beer of the Luzon mountain area.

Ceramic vessel from Negros island. First millenium B.C. 31.2 cm. Lent by the University Museum, University of San Carlos, Cebu City, Cebu.

pines. These traits may also, however, have cost him his life. He was a tough and brave man, working among a people where such machismo *could easily prove fatal.*

He is writing from Dumubatu near the edge of Ilongot country, in western central Luzon, having been delayed there by reports of cholera in better-pacified areas downstream near Echague.

My dear Doctor Dorsey:
I thought I had sent you my last letter from this bunch of Ilongots but here goes another because I have a chance to send it. I am still here because the men have not yet made balsas enough to raft me and my all down to Echague. When Bowers[1] left here last fall he cleaned up all the balsas; and though the river has fallen 2 months earlier than last year the men have not been able to build other balsas. The bamboo material is just far enough away to make it risky to go for it and as I write a bunch of men have gone out to search for 2 youths who went for bamboo yesterday and have not returned and you see the weather is growing more torrid every day and the sun can now shine for a whole day at a time. As a result every Ilongot house is on the watch for prowlers looking for heads and ambitious youths are off looking for the same in other districts. As Capt. Bowers said at Tamie when the Ilongots refused to do his bidding because what he wanted involved a taboo: "This may be good ethnology, Jones, but by God it makes me tired." He said he had seen many kinds of damned fools in these islands but the Ilongot was the damnedest. Well I don't know that I would agree with the sentiments he expressed, but he is probably correct when he thinks the Ilongot exasperating from a practical point of view. I shall need about 15 balsas and I've sent for Panipagan and Kagadyanan to come down with 8 but I don't know what is keeping them. I would not bet on it but I believe I shall be out of here in 10 days.

I've just returned from a visit of nearly a week in the mountains of the west. I got a few objects I did not have and a little extra information. What wearied me was to hear of my Alikod friends off on a head hunt, their objective being Gumiyad. This place is southwest of Ifugu in the mountains and is said to be a large district. I tried getting there once but my friends balked on account of the rains, the prospect of lack of food and the report that a war party of Gumiyad was in the neighborhood of Alikod. They wanted to get on trail of the party and cut off its return. Please don't entertain any notion that I am seeking for adventure and naturally there's a little risk but so there is riding in the cart behind the old grey mare. The point is this—warfare among the wildmen of Luzon is rapidly being checked[2] and this is practically the only territory where the mice have free play. And so all I've desired and still desire is to observe and note what happens.

. . . Smith[3] sent me word that the cholera

1. A U.S. Army officer who had commanded a recent pacifying expedition.

2. Not among the Ilongot, as it turned out. They were still hunting heads as late as the 1970s.

3. A trader.

Continued on p. 28

William Jones

A Philippine Afternoon

Sunday, July 18

Celebrate the traditions and cultural heritage of the Philippines on Sunday, July 18, at Field Museum. This special event complements the opening of our newest exhibit, "The People and Art of the Philippines," on view from July 17 through December 31. Including 400 objects selected from 29 museums and private collections throughout the world, this exhibit is the first comprehensive survey of Filipino art ever organized in the United States. It represents all periods and styles of Filipino art from prehistoric to modern times.

"A Philippine Afternoon" features traditional Philippine dance by Lakambini of the Urban Gateways Folk Arts Program at 1:30 p.m. and 3:30 p.m. A troupe of young artists dedicated to preserving their Filipino heritage, Lakambini performs dances that reflect the Indo-Malaysian,

Muslim, and Spanish influences found throughout the Philippines. Lakambini dances to a kulitang orchestra, with traditional music made on a set of graduated gongs. Come and taste delicious Philippine cuisine from 1:00 p.m. to 3:00 p.m. Sample both indigenous dishes and foods reflecting the influence of Indonesian, Asian, and Spanish cultures. Dr. Bennet Bronson, associate curator of Asian Archaeology and Ethnology at Field Museum, offers an illustrated lecture entitled "The Philippine Connection" at 2:00 p.m. in Lecture Hall I. His lecture traces the history of Field Museum's outstanding collection of Philippine artifacts; the Museum's collection is considered to be one of the world's finest.

All events are free with admission to the Museum. Tickets are not required. "A Philippine Afternoon" is a Related Learning Museum Special Event. For more information, call (312) 322-8854.

Overlooking the lush greenness of the irrigated river valley is the ancient Chimu fortress at Paramonga, 200 km north of Lima. The 52 rivers that cross-cut the narrow ribbon of coastal desert, only 10 of which flow year-round, provide the only water for irrigation of the coastal area.

PERU'S PRECERAMIC MENU

by Barbara Jackson and Terry Stocker

Photos courtesy of the authors

ONE OF THE MAJOR AREAS of prehistoric civilization in the New World is the stark desert landscape of coastal Peru. The founders of this ancient civilization constructed elaborate stone buildings almost 4,000 years ago. This monumental architecture, a hallmark of civilization, is the earliest in the New World and was erected by a population to which the technology of ceramics was still unknown—a unique situation in world history. Essential to an understanding of how civilization developed in such a barren, austere environment is a consideration of food resources that comprised the preceramic menu.

The role of maritime resources in the development of sedentary populations has ignited anthropological controversy and discussion. One school of thought, led by Michael Moseley, associate curator of Middle and South American archaeology and ethnology at Field Museum, proposes that the food supplies made available

by the teeming Peru Current provided a substantial basis for civilization development. Opponents of this theory—citing the unreliability of the sea as a constant food source and the low protein value of seafood—argue that Peru's irrigated river valleys were the predominant geographical area providing the food base for a developing civilization.

COASTAL ENVIRONMENT and FOOD GATHERING

A great variety of ecological zones, resulting from the unique geography of the Peruvian coastal strip, appears to have enabled the preceramic groups to amass and store considerable amounts of food. The desert coast strip, ranging from 10 to 80 km (about 6 to 50 miles) in width, extends the length of Peru, a total of 2,250 km. To the east, the desert sands ascend abruptly into the backdrop of the towering Andes Mountains, the source for the 52 rivers that flow through the coastal zone into the Pacific. The exaggerated ascent of the coastal shelf to the Andes is occasionally interrupted by low hills, known as *lomas*, or fog oases. The cold and immensely rich Peru Current (formerly called the Humboldt Current) borders the ribbon of coastal desert closely on the west.

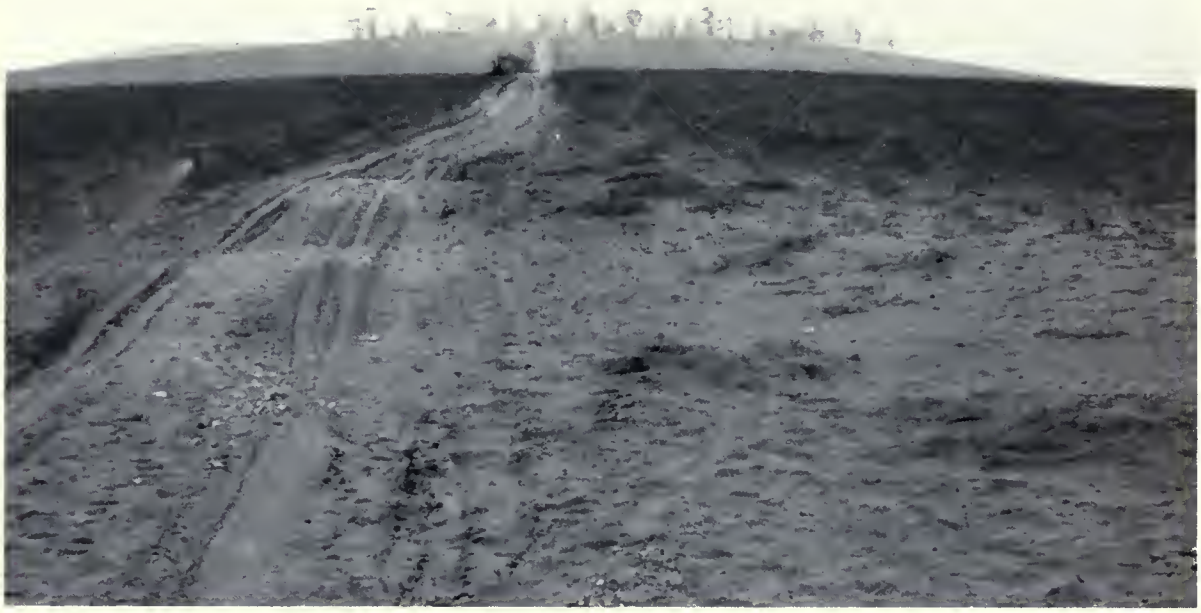
The coastal strip is cross-cut by a series of rivers, some flowing only intermittently in accordance with the highland rainy season. Coast travelers are often struck by the juxtaposition of green, fertile river valleys with the adjacent monochromatic desert landscape; one can literally stand with one foot in the hot desert sand and the other in verdant vegetation.

Early preceramic peoples may have collected for consumption river valley plants that were the precursors of such cultigens as squashes, beans, and peppers. As an increased variety of domesticated plants, including peanuts, cucumbers, and manioc, became available during the later preceramic periods, cultivation efforts were probably intensified. The location of many cotton, preceramic sites (*i.e.*, where cotton had been introduced) such as Huarmey (in the Huarmey River Valley) and El Paraiso (in the Chillón River Valley), close to cultivatable land as well as to the sea, indicates that the inhabitants of these sites were well aware of the advantages of multiple food source exploitation and that they constructed their population center in ways to maximize use of the ocean as well as of fertile lands.

It is possible that some vegetal items were cultivated away from the river valleys on the *lomas*. About 3 to 8 km inland, these hills are distinguished from the desert by seasonal plant blooming and growth made possible by moisture precipitated from a fog blanket, or *garua*. This phenomenon is characteristic of the six-month Peruvian coastal winter, which is concurrent with the highland summer. Moisture from the *garua* provides virtually the only precipitation for the entire coast since rain falls only about once every 20 years. Moisture accumulation in plant systems and blooming depend upon condensation on dormant plant cover. Cyclical variations in amount of *garua* precipitation result in varying degrees of plant growth.

The over-exploitation of trees and shrubs for fuel and construction has denuded most *lomas*, except for some grass cover during the *garua* months. Long-time residents of the coast describe the *lomas* as being covered with small trees and bushes as recently as 30 years ago. Reforestation experiments at several ancient *lomas* are allowing geographers, ecologists, and ar-

Lomas *such as the experimentally reforested one in the background were probably a source of firewood and building material for ancient Peruvians.*



chaeologists to see what *lomas* may have been like prehistorically. Plant, animal, and bird life combine to produce a charming, mist-filled dreamland in precarious balance between climatic factors and human needs.

The preceramic menu may have included several *lomas* food items when in season. Many plants that grew in the river valleys may have also grown on the *lomas* hillsides alongside such fruit trees as the *mito*. Small animals such as foxes and rodents may have been hunted on the *lomas* and in the river valleys by ancient Peruvians. But judging from the low frequency of land mammal bones recovered from preceramic sites, it appears that the coastal terrestrial environment afforded a minimal amount of meat protein sources.

The importance of *lomas* as a prehistoric food resource environmental zone is very uncertain. Cyclical fluctuations of *garua* intensity often result in minimal blooming. In fact, in only one of the last five years was there sufficient precipitation to result in lush growth on the *lomas*. It is very possible that the *lomas* were of greater value to preceramic peoples as a resource for products like grasses and woody shrubs used in mat and housing construction and for fuel and as a grazing area for highland animals during the highland dry season.

The seasonal blooming of the *lomas* occurs during the highland dry season, when the highland food resources are at their lowest. Prehistoric Peruvians may have followed llama and guanaco herds in search of grazing areas from the highlands down to the coast, where they could graze on the grassy *lomas* slopes during moist coastal winter months. Remnants of ancient stone corrals used by prehistoric herders still stand, and many of these provide the foundations for corrals used by modern herders during their seasonal residence on the coast.

The Andes Mountains, descending so sharply to the coast in a series of abruptly angular trenches, were also an accessible environmental zone to ancient coastal Peruvians. The steep valleys, easily traversable by sturdy prehistoric peoples and their herds, were corridors linking food resources and populations in the highlands and coast. In fact, it is only 60 km from the early coastal preceramic site of Paloma to the sierra cave site of Tres Ventanas, dated to about 8,000 years ago. A significant number of shellfish remains have been recovered from Tres Ventanas and other highland sites, confirming that food was transported from the coast up to the mountains. Archaeological testimony is only of shell transport from coast to sierra, but it is probable that the reverse was true and that many highland food products were included in the coastal preceramic diet. Guinea pigs and ducks may have been domesticated in the highlands as early as 7,000 years ago. Grains such as the high-protein quinoa and amaranth may have been domesticated at about the same time. Together with such tubers as potatoes (the time of

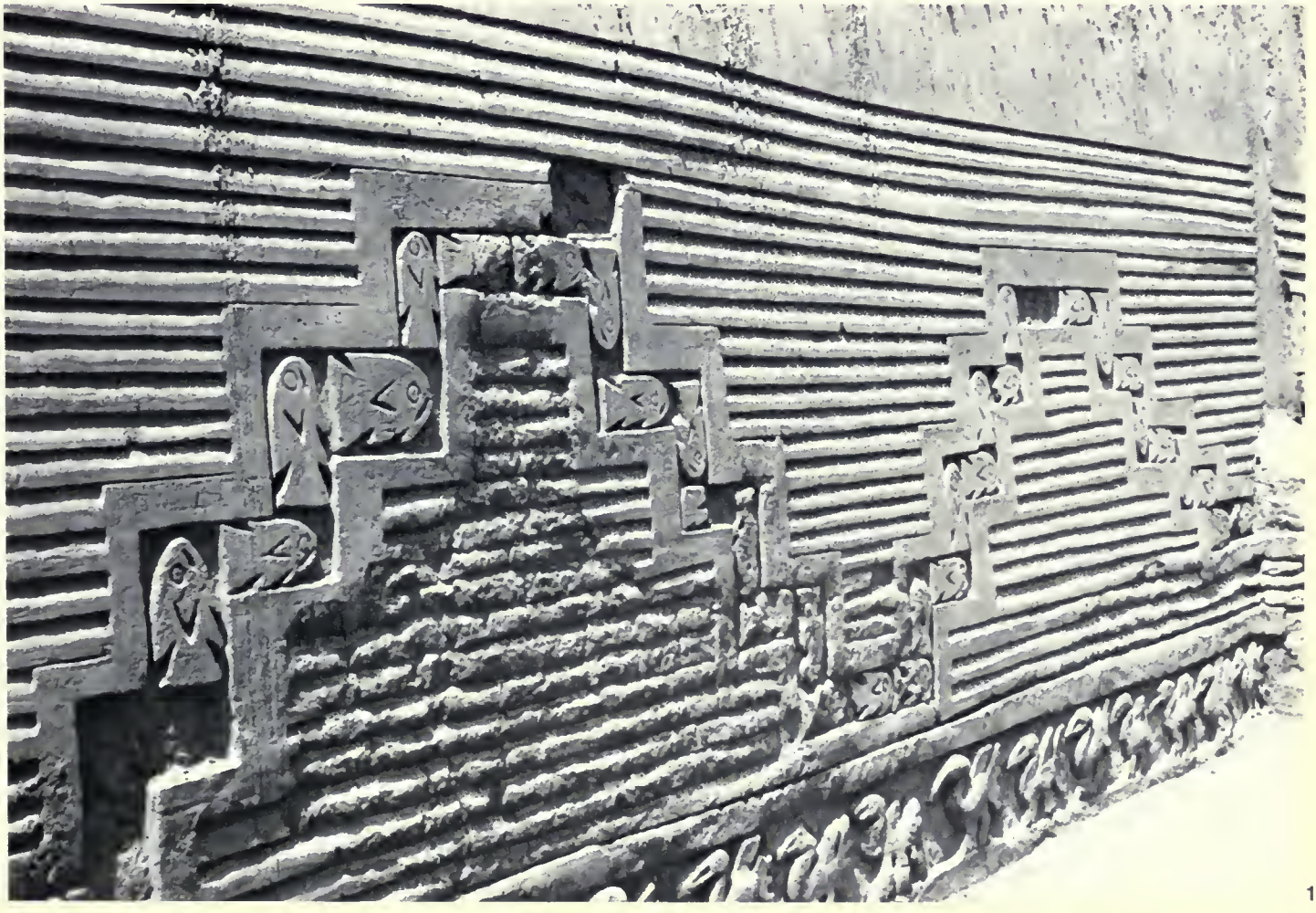
domestication of which remains uncertain), these highland foods would have contributed to a diversified and substantial protein base. Highland transport of such foods to the coast in exchange for preserved marine foods like dried shellfish and salted fish must certainly have played a role with the sea resources in the development of early coastal civilization.

SEAFOOD

The seafood portion of the preceramic menu, listing a large variety of items, was an extremely important resource base for coastal preceramic groups. New information has led to a clearer evaluation of the role that maritime resources may have had in laying the foundation for that developing Peruvian preceramic civilization characterized by its monumental architecture. In our travels, we have traversed the entire coastline of Peru, visiting archaeological sites and interviewing local inhabitants. We lived for six months in the small fishing village of San Bartolo, about 60 km south of Lima, where we participated in fishing and in shellfish gathering with the villagers and sampled many of the same delicious seafood items that had once contributed to the preceramic diet base. In addition, as members of an archaeological project excavating the early preceramic site of Paloma, we had the opportunity to partake in the uncovering of the lifeways of these ancient Peruvians. The site has been dated to approximately 8,000 to 5,000 years ago and has a very well preserved series of human, artifactual and ecological remains.

The exceptional preservation of this and other coastal sites is due to the aridity of the coastal environment. Industrious native Peruvians, to the despair of archaeologists, have taken advantage of the well preserved products of their distant ancestors. Looted pottery, finely woven textiles, and delicately wrought gold and silver *objets d'art* demand handsome prices on the international antiquities market. Today, the discarded remains of hastily looted excavations lie scattered over the desert surface, mute testimony to decades of intensive grave robbing.

Fortunately, the arid environment has also preserved less aesthetic cultural aspects, namely garbage middens. Middens, which are mounds consisting of shells of edible mollusks and other refuse marking the sites of prehistoric human



The importance of marine resources to the daily life of ancient Peruvians was shared in their ideological realm. Stylized representations of pelicans and fish motifs at the 600-year-old capital of the imperial Chimu kingdom of Chan-Chan on the north coast of Peru illustrate the weaving of marine resource awareness into architectural and ideological design.

habitation, are easily identified by the scattering of white shell fragments in the sandy Peruvian desert. Midden remains hold important clues of prehistoric diet and the methods employed to obtain those foodstuffs. The composition of precotton, preceramic middens like those at Paloma as well as later cotton, preceramic middens such as those as Huaca Prieta and Alto Salaverry, indicate that the sea was used extensively for a variety of food sources throughout the preceramic periods.

These food sources are of three general types: fish, shellfish, and sea mammal. Our research has evaluated each of these categories in terms of ease of acquisition, transport to habitation sites, processing techniques for consumption, preservation methods for storage, and relative importance in the preceramic diet.

The deep Peruvian coastal waters constitute perhaps the richest marine biome in the entire world. The Peru Current, sweeping up from cold southern Antarctic waters, closely parallels the Peruvian shoreline because of the abrupt incline of the Andes from the ocean floor. A phenomenon called upwelling, produced by a combination of wind and ocean movements, brings colder, plankton-bearing, deeper water closer to the ocean surface, thus creating a rich feeding ground for anchovies and progressively larger fish and sea mammals such as seals and whales. The proximity of this feeding ground to the ocean surface and to the shoreline allowed it to be exploited extensively by prehistoric human populations.

Peru leads the world in anchovy fishmeal production; used primarily as a protein-rich animal feed, it is exported worldwide. The consequences of decades of intensive anchovy exploitation have induced the present Peruvian government to implement and enforce legislation limiting the annual tonnage of anchovies harvested.

The presence of numerous bone and shell fishhooks, along with identifiable fish remains, in preceramic middens, confirm the listing of a variety of fish dishes in the preceramic food base. Over 250 species of fish inhabit the rich feeding grounds of the coastal waters. It is questionable whether the technological capabilities of the earliest fishermen permitted extensive exploitation of this abundant fish population. Cotton used in durable fishing nets was not domesticated until approximately 4,500 years ago. It is possible that, prior to the domestication of cotton, nets were made from grass fibers collected from river valleys and blooming *lomas*.

The ancient inhabitants of the precotton,

The 3,500-meter-high Andean puno is the natural habitat of the llama. In search of grazing areas during the highland dry season, ancient Peruvians may have traveled to blooming coastal lomas, *following herds of llama and guanaco. Modern herders travel to the coast during the coastal winter season, utilizing prehistoric stone corrals on* loma *hillsides to house their herds after grazing.*

preceramic site of Paloma crafted fine grass nets for use as body and head coverings, so we know that the ability to make nets antedated by thousands of years the domestication of cotton. Fine bone needles and tools found in association with preceramic burials and houses may have been used for net-making. Gourds, a common find in early preceramic middens, may have been used as net floats. Although grass fishing nets have never been recovered from preceramic middens, it is possible that their exposure to the ocean waters may have hastened their decomposition. Nets may also have been discarded on the beach rather than at the occupation site, as much as 5 km away.

It is also questionable whether ancient Peruvians used boats to fish in richer waters further from shore. Like nets, remains of boats have not been found in early preceramic sites. Ancient Peruvians may have used tule reeds growing in river valleys to construct boats similar to those used today by crab fishermen of the town of Huanchaco, near the archaeological site of Chan-Chan on the north coast of Peru. Tule boats, known as *caballitos de tortora* (reed ponies), are known archaeologically through 2,000-year-old Moche ceramic depiction. Tule reeds have been found in preceramic middens, and it is entirely possible that early Peruvians utilized them much as they are used today. The absence of boat remains in the archaeological record could be for the same reasons affecting the preservation of fishing nets.

Anchovies. Although it is uncertain whether nets and seaworthy fishing craft were used, it is clear that fish, specifically anchovies, were a substantial protein source to preceramic Peruvians. Excavations at Paloma revealed that anchovy fishmeal comprised the majority of the fish remains uncovered at the site. The significance of anchovies in the preceramic diet as well as the presence of numerous grinding stones found in the remains of Paloma houses—an incongruity in a supposedly preagricultural society—was puzzling. Fortunately, we witnessed a remarkable phenomenon during our residence in San Bartolo that helped us to fit the puzzle pieces together:

For two days and two nights, thousands upon thousands of anchovies followed by the larger jurel, a fish similar to mackerel, "leaped" onto the shore, beaching themselves. The townspeople told us that such fishruns occur about four times during the course of the year. Villagers left countless anchovies to rot on the beach, in favor of the tastier jurels which were easily and rapidly caught from rocky jetties with a simple hook and line.

Periodic prehistoric anchovy runs would have enabled ancient Peruvians to gather great amounts of anchovies and other fish without the benefit of nets and fishing craft. The periodic occurrence of fishruns not induced by man has been documented ethnographically for South and Central America. During one of the days of the anchovy run, we fished offshore with a net. The number of fish obtained (over two wheelbarrows full), in addition to a bucket of crab, was certainly in excess of ordinary hauls and emphasized the immense amount of protein that could be easily acquired during periodic fishruns.

It appears that the ancient Palomans utilized bountiful anchovy runs by converting the fresh fish into preservable fishmeal. Processing probably involved the following steps: First, the fish may have been placed on the ground or hung in net bags for a few days. In the latter case, oil could be collected as the fish dessicated. Modern Peruvians use fish oil as a soup base and the oil may have been used in much the same manner prehistorically. Once dried, the fish may have been ground into meal in grinding stones. The remaining oil in the fish would reduce friction, thus explaining a lack of wear and polish on the Paloma grinding stones. The meal was probably dried for a few more days to prevent spoilage.

Anchovy stratigraphic lenses (*i.e.*, archaeological deposits, lens-shaped in cross section) at Paloma were initially interpreted as the residue of fishmeal production. However, the absence of foreign elements such as flies, indicate that these deposits were primary storage. One might imagine coastal villagers laboring night and day during fishruns to procure and process as many anchovies and other fish as possible. It appears that these villagers stored the fishmeal produced for future use by heaping it on the ground then covering it with earth to prevent its exposure to the *garua* and pests. The relative ease of acquisition and processing would probably have made anchovies one of the least expensive items on the preceramic menu as well as a staple during food crises.

Whales. The chance witnessing of the fishrun helped us to fit other pieces of the puzzle of the preceramic diet together. Whale bones are found in almost all Peruvian coastal preceramic middens and were occasionally used as housing construction material and even perhaps as sacred chairs for important members of the group. Whale strandings along the Pacific shores of the Americas occur today and are documented prehistorically for the Old World through artistic depiction. Ethnohistorical accounts relate the gathering of groups of coastal peoples and the complex social rituals called for at the occurrence of a whale stranding. The reason

R. Benfer, co-principal investigator of the Paloma excavations, photographs the well preserved mat and grass covering of an ancient Paloma burial. The grass, locally known as junco, *was probably collected from the Chilca River Valley 7 km away.*

whales beach themselves, singly or in groups, remains a mystery. However, the phenomenon of beaching explains the finding of whale bone in the refuse of preceramic cultures that did not have the technological capabilities to pursue whales at sea. Is it possible that the preceramic food base may have included whale meat and other whale by-products, not just as a once-in-a-lifetime treat, but as a relatively common, if not regular, meal?

The stratigraphic cut at a refuse midden of the Tank site at Ancon has an accumulation of shellfish remains more than 6 meters deep. Shellfish were an important item on the preceramic menu although the preservable and bulky nature of shell may skew the assessment of preceramic diet by inflating its protein and caloric value. Nevertheless, middens such as these document its common and standard placement in the preceramic diet.

Baleen whales, so named for a whale bone in place of teeth, allowing them to strain small organisms from water, find the coastal cold Peruvian waters attractive because of the rich supply of plankton. Within the last 100 years, the coastal Peruvian whale population has been seriously decimated due to heavy whaling operations. In fact, blue whales, weighing over 150 tons as adults, have vanished from coastal Peruvian waters because of over-exploitation. It is certain that the number of whales was much higher prehistorically than today. Whale beachings may have been as frequent as anchovy runs. Although there is of course a vast difference in the number of fish versus the number of whales that beach themselves, the amount of immediately accessible protein represented may be roughly comparable if not in favor of the whale. The few numbers of whale bone found in preceramic middens may merely be a reflection of the transport problem involved, rather than of the frequency of whale strandings. Historical documentation of stranded whales on the coast of South America tell of beaching-site butcherings, with as much fresh meat as possible consumed during feasts that lasted several days and were attended by groups of coastal residents who came to share in the food resource temporarily made available in the huge body of a beached whale. A whale carcass could not be processed for storage by preceramic Peruvians and so was only a temporary boon to their food supplies. Because

anchovy fishmeal, on the other hand, could be preserved and stored for many months, possibly years, it was certainly a much greater and an exceedingly more reliable protein source than the immense whale.

To our knowledge, there has been no attempt to calculate the caloric and protein value represented by the preceramic presence of whale bone. Adult whales range in size from about 10 to 30 meters (approx. 35 to 100 feet) long and up to 150 tons in weight, depending upon the species. A section containing one adult vertebra represents at least one ton of edible meat. The total amount of edible meat available from a stranded whale is almost beyond comprehension.

Of course, the common listing of whale meat and by-products on the preceramic menu cannot be substantiated until a reliable estimation of the frequency of whale strandings is made. Unfortunately, there is very little information on the subject. We have discussed the difficulties of accurate assessment of such nonseasonal and, apparently, randomly occurring phenomenon as whale strandings with staff scientists of the Peruvian Institute of the Sea. One of these scientists related an account of a whale stranding about 100 km south of Lima that had been told to her. A man who had witnessed a whale beaching went to Lima for a truck to transport sections of the whale. On his return to the whale beaching site two days later, all evidence of the whale had disappeared. The event was not substantiated in any standard way, and serves to illustrate the difficulty of obtaining reliable data on such a matter.

Seals, Sea Birds. The ecological interface between the land and the sea contributed other food items. Ethongraphic literature on South American Indians documents the hunting of seals by hunters using heavy sticks to club the seals to death while they slept on the beach. The remains of seals and sea lions comprise a significant part of preceramic middens and indicate their important positions in the preceramic diet.

Sea birds roosting on rocky enclaves were also subjected to surprise attacks by ancient hunters. The consensus among native Peruvians, in our conversations with them, is a distaste for sea birds as a food source even in times of dire hunger. Perhaps ancient Peruvians felt the same way and gave sea birds a lowly place as a dietary source, thus explaining the low proportion of bird bone in preceramic middens.

Shellfish. Conversely, shellfish were awarded a much higher position. The Peruvian coastal shellfish population is not only very high in numbers but has an extremely wide range of species. Opponents of the maritime foundation of civilization theory argue that shellfish is a poor protein source and could not have contributed significantly to the dietary requirements of a developing society. However, estimations of protein value have commonly been based on freshwater shellfish and are therefore not relevant here. The vast amounts of shell refuse characterizing precotton, preceramic middens indicate that indeed they were consumed as a staple in the earlier preceramic periods. The almost seven-meter-deep accumulation of shell refuse at the 8,000-year-old Tank site at Ancon, north of Lima, demonstrates the popularity and importance of shellfish in the preceramic diet.

The decreased importance of shellfish in the later cotton preceramic era is indicated by a reduction of the proportion of shellfish debris in later middens. With the domestication of cotton used in fishing net manufacture, fishing may have replaced shellfish collecting as an intensive daily subsistence activity to provide more food for a growing population; however, shellfish certainly continued to be gathered and consumed regularly. Human predation of shellfish through thousands of years may also have led to the reduction of the easily accessible shellfish populations.

Many shellfish that served as a food resource for early preceramic peoples were easily obtainable and did not require elaborate equipment. Techniques of collection were probably much the same as those used today by coastal shellfish gatherers. Net bags or gourds were used to carry the collected shellfish. It appears that several of the gourds found at Paloma were mended and possibly decorated, an indication of their importance as containers prior to the invention of ceramics.

Choros (*Aulacomia ater* and *chormytilus chorus*), types of mussel, are the most abundant and popularly purchased shellfish in Peru today.

A cache of bone fishhooks and a coral abrader found in excavations of a house at Paloma. Preceramic fishermen tied strings made from grass fibers around bone and shell fishhooks to use for fishing in the nearby Pacific.

Fish is a popular Peruvian dish, perhaps reflecting a taste acquired over 5,000 years ago.

Their natural habitat ranges from about 30 meters to 1 km offshore and between 20 to 35 meters deep on a rocky sea floor. Their overwhelming presence at such sites as Paloma indicates that prehistorically choros occupied habitats closer to shore. All the choro divers that we have interviewed speculate that shallow beds must have been enormous in the preindustrial era. Large choro beds are still occasionally found close to shore but are rapidly decimated by divers. The collection of choros simply involves raking them from the sea floor into a net. Ancient Peruvians may have floated bundles of tule reeds out to deeper waters and used them to support the weight of the shellfish catch.

The proportion of shellfish in middens at different locations reflects differing shellfish habitats in accordance with geographical characteristics. For example, machas (*Mesodesma domacium*) were not frequently consumed by ancient Palomans although these clams comprise a major portion of the preceramic Chilca middens 15 km from Paloma. The shoreline closest to Chilca is a sandy expanse of beach which is the natural habitat of machas. In contrast, the closest beach to Paloma is a rocky inlet highly amenable to choro habitation.

Machas are found very easily by observing their movement in sand and/or by wading in water knee-deep and feeling for them with the feet. They are harvested today with a hoelike device. Prehistoric Peruvians may have used a similar method by attaching a large shell to a stick or simply collected them by hand. The rarity of machas in the Paloma middens and the rarity of choros in the Chilca middens indicate that these early preceramic groups had exclusive territories.

The fishing village of San Bartolo.

The relative frequency of almejas (*Semele saeida*), a clam found in preceramic, precotton middens, points to a lower frequency of consumption, possibly because they are more difficult to procure. Since they are attached to rocks, they must be pried loose with a sharp implement. Nonetheless, ancient Peruvians enjoyed large, very tasty almejas on a regular if not daily basis.

Pectens (*Pecten purpuratus*) are considered a shellfish delicacy in Peru and accordingly are relatively high priced. Harvesting techniques are the same as those employed for choros. Along with almejas, machas, and choros, pectens are only the most commonly seen shellfish along the coast of Peru. An amazing number of species inhabiting the coastal waters lend themselves to a very tasty and diversified seafood cuisine. The range of species recovered from preceramic middens along the coast bear witness to the fact that many other shellfish types, including snails, were commonly consumed foods in the preceramic periods.

Shellfish may have been dried for later consumption by heating over an open fire. Our own experiments confirm that shellfish can be preserved for at least three days by removal of the moisture through heating on an open hearth. Using plants, specifically achupalla and cactus, gathered from the *lomas* for fuel, we conducted a series of tests involving roasting choros over an open fire. A minimum of 110 grams (4 oz.) of achupalla and 450 grams (1 lb.) of cactus was necessary to adequately cook a dozen choros. The amount of fuel required may point to the processes involved in prehistoric denudation of the *lomas*.

Shellfish provided an important material resource to early preceramic peoples as well. The noted archaeologist Junius Bird found in his excavations at the preceramic, precotton site of Quiani, Chile, that the earliest inhabitants of Quiani used shells to the exclusion of all other material in making fishhooks. It appears that the same is true for the early Palomans, who only later used bone as a manufacturing material for fishhooks. Shell as a material source is durable and produces a fine, sharp edge, making it ideal for knives and scrapers. Many tools made from shell, an easily acquired material, have been recovered from preceramic middens. In addition, jewelry made from shell was raised to the level of a fine art in the coastal cultures. Even as far back as the early preceramic, individuals utilized shells to make tubular and circular beads and pendants of various shapes and sizes for decorative purposes. Burials excavated at the site of Paloma show that ornamental shell pieces were worn as collars and bracelets.

The sharply descending crevices of the geologically young Andes Mountains were likely the pathways of ancient Peruvians traveling to the coast and back again to the sierra.

Supplementing the clues provided by the well preserved remains of preceramic meals and the tools and equipment used to procure those meals, studies of the human remains of the preceramic site occupants are helpful in clearing our blurry picture of the preceramic coastal dietary base. The high incidence of exaggerated lower back osteoarthritis among prehistoric Peruvians indicates that these individuals participated in activities that were highly stressful to the lower back. The daily transport of net bags and gourds filled with harvested shellfish on one's back from the collection areas to the occupation site would certainly have contributed to, if not caused, a painful arthritic condition.

THE DENTAL RECORD

A diet high in shellfish and other seafood is considered to be highly abrasive to teeth. The preceramic menu included daily quantities of sand

Caballitos, *"little ponies", are used in the town of Huanchaco, 20 km north of Trujillo, for crabbing today. Tule reeds, from which such boats are made, have been identified in coastal preceramic middens. Ancient Peruvians may have used similar watercraft to collect shellfish and to fish in deeper offshore waters.*

and minute fishbone, unavoidable in the consumption of shellfish and anchovy fishmeal. Preceramic skeletons show extreme tooth wear as a result of a highly abrasive diet.

Abscesses can result from extreme tooth wear, as well as from periodontal disease and cavities. An infection at the tooth root will often spread, destroying the surrounding bone if it remains untreated. Without the benefits of modern medicine, abscesses spreading to other areas of the body can result in death.

A diet high in abrasive contents such as that of shellfish and anchovy fishmeal has resulted in the complete removal of the enamel surface of this maxillary first molar and loss of much of the enamel surface of its adjacent partners of this former Paloma resident.

The close examination of teeth can be very important in evaluating the dietary health of prehistoric peoples. Macroscopic defects such as enamel hypoplasia, which appear as readily visible linear grooves or pits, indicate certain health stressful conditions suffered by the individual. These conditions may result from disease, metabolic disturbances, or malnutrition. The preceramic diet was subjected to periodic food shortages, perhaps causing the development of enamel hypoplasia in many preceramic individuals.

EL NIÑO

Periodic extreme food shortages were due to a natural, disastrous event known as *El Niño* ("the child") so named because of its common appearance during the Christmas season roughly every 20 to 25 years. (See "El Niño, the Catastrophic Flooding of Coastal Peru," in *Bulletin*, July-August and September, 1979.) El Niño is a warm-water intrusion from the north into the Peru Current, diminishing the upwelling of colder deeper water. Elevated water temperatures kill off the plankton, initiating a calamitous sequence of events for the rest of the plankton-dependent trophic chain. The equatorial warm water thrust into the colder Peru Current disturbs the climatic equilibrium and periodically results in torrential rainstorms causing extensive flooding on the coastal desert strip. Flooding of cultivated land, along with diminished sea resources, as a result of particularly intense El Niños, results in drastic food shortages today. The prehistoric consequences must have been even more disastrous. Yet, preceramic peoples managed to develop and flourish as a civilization through such cyclical food shortages. To combat periods of food crisis, the preceramic food re-

source base included a variety of storeable items such as anchovy fishmeal and vegetal products that could be accumulated well in advance and stored in mass quantities.

The innovation of permanent building facilities like those found at the 4,000-year-old El Paraiso is indicative of the implementation of permanent and increasingly larger storage facilities. Only one building was excavated at El Paraiso by Frederic Engel, an archaeologist well known for his preceramic discoveries at such sites as Paracas, Asis, and Paloma. This building was excavated because it was one of the smallest structures visible and its location on high ground prevented its being totally embedded in silt carried by the Chillón River. This 35-room building, we believe, was a storage facility, although negligible artifactual remains were found during excavation in support of this conclusion.

The excavated building at El Paraiso is in an easily defensible location abutting the hillsides of a small valley. It is likely that during extended periods of food crises, as after a devasting El Niño, sites such as El Paraiso would have been threatened by groups desperate for foodstuffs. The location of the El Paraiso storage facility reflects the high priority of defensibility given to stored food supplies.

The cotton preceramic construction of large, permanent, and defensible storage facilities suggests several conclusions. First, the populations responsible for the construction of such sites as El Paraiso had enough person-power to concentrate on architectural endeavors as well as to support the population with their dietary needs. Secondly, the construction of elaborate stone architecture and the procurement of mass quantities of storeable foods points to a stratified level of society with leaders directing large numbers of workers. Thirdly, the preceramic food base definitely included those large storeable quantities of food necessary to provide the basis of civilization development.

It appears that the preceramic menu not only provided a steady food base, but one that was highly diversified and savory. This was possible because of the prehistoric multiple exploitation of land as well as sea resources. Perhaps the diversified cuisine was an important factor in the subsequent civilization growth and reflected a cultural predisposition for experimentation and utilization of all available resources. □

A close look at the only entrance to what is believed to have been a storage facility. The 4,000-year-old building is located on the upslope of the river valley and built on a series of platforms, perhaps to guard stored fishmeal and other food products against periodic flooding and raids by hungry preceramic groups.

Morpho granadensis, male

MORPHO

The Jewel of Tropical Rain Forests

by ALLEN M. YOUNG
Photos courtesy of the author

The magnificent morpho butterflies of the Amazon rain forest stunned the early naturalists from Europe who saw them for the first time more than two centuries ago. Perhaps nowhere outside the tropical rain forests of Central and South America, where they number some 40 species, have large butterflies of such awesome beauty been found. The name "morpho" is an alternate name for Aphrodite, the ancient Greek goddess of wisdom and beauty.

The upper sides of their expansive, brittle wings have a glistening, iridescent blue sheen. The iridescence, ranging from vivid, almost mirrorlike dazzling blue to deep purple and brown, is due to complex arrangements of microscopic grooves on the tiny, shingled scales, which absorb all but the blue wavelengths of daylight. In this respect, the morpho's blue differs from other butterfly colors, which are due to pigment. Throughout the animal kingdom, as a matter of fact, blue coloration is seldom due to pigment.

The intensity of the blue reflection depends on the angle of wing to sunlight. When the sunlight is almost perpendicular to the wing surface, the brightness of the blue is greatest; further from the perpendicular, the wing appears less blue and more brown. Because these magnificent butterflies, so popular with collectors (as well as makers of inlaid table tops, coasters, wall decorations, and a multitude of curios), have long been zealously sought out, wing material has also been in ample supply for biologists investigating the phenomenon of iridescence.

The eyes of the butterfly are very sensitive to blue color; male morphos, for example, will

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often pursue a blue workshirt for some distance. Thus, the blue may function in courtship from a distance, allowing cruising butterflies to locate each other and initiate the early stages of courtship if the signals and partners are right. In some species only the males are blue, the females being orange and brown. Such sexual dimorphism suggests a lower price tag placed on males; females, being egg-bearers, are less expendable and therefore more cryptically colored.

In morpho species with sexes of similar appearance, flash communication from a distance may bring potential mates together; other cues then take over in determining species recognition. But the attractiveness of the color is also a disadvantage: some insectivorous birds are remarkably agile at catching the butterflies on the wing. I have found heaps of wings of morpho butterflies in forests. Even so, some of the more iridescent species, by erratic flight patterns, may evade the birds. Slow-motion photography of a morpho in flight shows the insect literally dropping from sight against the forest backdrop. This can occur when the wings close, thus concealing the iridescence, or when, for a fraction of a second, the angles of the wings to the sun are so oblique that the insect becomes a brown smudge against the forest.

Some morpho species feed mainly at dusk. As the butterflies are settled on the ground, with wings closed, the large eyespotlike markings on the underside are enhanced by the rays of sunlight filtering obliquely through the forest, perhaps frightening off predators such as small lizards roaming the forest litter.

Much more is known about the mechanism of color in morphos than about their natural history and biology. Gradually, however, we are coming to understand the life cycle and natural history of widespread species such as *Morpho peleides*, a member of the *achilles* superspecies complex believed to have evolved in the Amazon rain forests. *Peleides* is one of two *achilles* species that have extended into the humid and moist mid-elevation and lowland forest zones of Central America and Mexico. *Peleides* and its near relative, *Morpho granadensis*, found in Costa Rica's Caribbean or Atlantic watershed rain forests, have been the subject of my investigation for the last twelve years.

The females of both species place their eggs singly on the upper surfaces of mature leaves of various trees, shrubs, and vines of the pea family (Leguminosae) bordering climax rain forest formations. I vividly remember my first sighting of an ovipositing female *peleides:* Wading through the clear, cold waters of a swift mountain stream, I came to a section where the butterflies were

Developmental stages of *Morpho peleides*. **Top:** first instar, which reaches maximum length of about 10 mm. **Middle:** third instar, which grows to about 40 mm. **Bottom:** prepupa, about 70 mm (2¾") long.

FIELD MUSEUM TOURS

Come with Us to Kenya!

Field Museum Tour for Members

September 11-30
Tour Price: $3,195
per person, double occupancy
single supplement: $430

optional extension to the Seychelles Islands: $1,135 additional

Itinerary

Sept. 11: Depart Chicago via British Airways for London.
Sept. 12: Depart London in the evening via British Airways for Nairobi, Kenya.
Sept. 13: Nairobi. Early morning arrival in Nairobi, where you will be met and taken to the luxurious Norfolk Hotel. The rest of the day will be at leisure to relax, sleep, swim, or wander around the shops.
Sept. 14: Mountain National Parks. Today you are off on safari, driving past estates and plantations to one of Kenya's gracious up-country hotels, the Outspan. Enjoy a buffet lunch here; this afternoon continue into the Mountain National Parks—a deeply forested area. Overnight will be at Mountain Lodge, a "tree house" sitting high above a lighted waterhole where you watch the game.
Sept. 15: Samburu Game Reserve. Leaving the park, continue along the valley and the slopes of Mt. Kenya, descending into rugged Northern Province. Pass through the town of Isiolo where your vehicle will be surrounded by smiling Kenyans holding out wares. Proceed to Samburu Game Reserve and view game as you drive to the lovely Samburu Lodge. Later in the day, a game drive.
Sept. 16: Samburu Game Reserve. A full day of viewing giraffe, zebra, and gerenuk. Samburu is also a very good park for elephant and leopard. Evening at the lodge.
Sept. 17: Mt. Kenya. After breakfast, drive to Mount Kenya Safari Club. Spend a restful afternoon at this resort with its magnificent gardens situated under Mt. Kenya.
Sept. 18: Mt. Kenya. Taking a picnic lunch, there will be a full day visit to a ranch for a rare opportunity to view game on foot, or you may wish to stay behind to enjoy the club's tennis, swimming, horseback riding, and trout fishing.
Sept. 19: Lake Naivasha. After breakfast, drive towards Lake Naivasha. The bird life is spectacular. In the afternoon you can swim in the pool or just relax.
Sept. 20: Masai Mara Game Reserve. This morning you will drive through the town of Narok, the main Masai town where you may wish to buy various wares. Proceed on to Masai Mara Game Reserve and your luxury camp, Kichwa Tembo. You will have an afternoon game drive, followed by cocktails around the campfire and a gourmet dinner.
Sept. 21: Masai Mara Game Reserve. A full day of game viewing. Game here is limitless. The lion population is very large. Also elephant, rhino, giraffe, hyena, cape buffalo, hartebeeste, topi, impala, gazelle, and bird life. Explore the river area, seeing crocodile or hippos. There is also the opportunity of a walking safari—where you will track animals on foot. After a long day in the bush, enjoy drinks around the campfire and dine in an elegance quite unexpected in the wilderness.
Sept. 22: Nairobi. After breakfast drive back to Nairobi, stopping en route for lunch at the home of Mrs. Mitchell, a life-long resident of Kenya, whose family began the first tea plantation in Kenya in the 1920s.

Arrival back in Nairobi will be in the mid-afternoon and will be at leisure for your own activities.

Sept. 23: Amboseli National Park. Off on safari again, heading towards Amboseli National Park, famous for its big game and superb view of Mt. Kilimanjaro. Following lunch at the lodge, spend the afternoon game viewing.

Sept. 24: Amboseli National Park. Following early breakfast, a full day of game viewing, taking a picnic lunch with you.

Sept. 25: Tsavo National Park. This morning continue further south to Tsavo National Park. View game before arriving at Kilaguni Lodge for lunch. From the lodge watch the game wander in to drink at the waterhole. This afternoon go out in search of the great herds of elephant. You will also visit at Mzima Springs where you will view from an underground tank hippo, crocodile and fish. Late this afternoon arrive at Ngulia Lodge.

Sept. 26: Mombasa. This morning drive to the luxurious Taita Hills Lodge, set among beautiful gardens. Continue southwards to Mombasa and the Two Fishes Hotel. Here the balance of the day will be at leisure.
Sept. 27: Mombasa. A full day excursion to Shimba Hills National Reserve, a forested plateau. Later this afternoon return to the comforts of your hotel.
Sept. 28: Mombasa. A full day at leisure to relax on the beach, swim in the Indian Ocean, or just soak up the tropical sun. There is also the opportunity to hire a boat and search for fish such as marlin, sailfish and shark. If your preference is the underwater world, you can go diving off the reef. This evening wander down to a local hotel for a cocktail or relax in the quiet of the Leopard Beach Hotel.
Sept. 29: Nairobi. Morning flight back to Nairobi, where day rooms have been reserved at the Norfolk Hotel for your convenience. The balance of the day will be at leisure for shopping and sightseeing. Late evening transfer to the airport for flight to London.
Sept. 30: Chicago. Arrive London early this morning and transfer to day rooms at the Sheraton Skyline Hotel. Your Chicago flight will leave early this afternoon, arriving in Chicago later the same day.

An optional excursion to the Seychelles Islands is available upon request. Operation of this extension is contingent on the enrollment of four or more people. The Seychelles, in the heart of the Indian Ocean, are acclaimed as one of the loveliest and most unspoiled beauty spots. They offer an atmosphere of timelessness and tranquility. Please let us know if you wish to have further information.

Audrey Faden, a native of Kenya, will be our guest lecturer. With her keen interest in wildlife, conservation, and plant life, she is a natural to lead our tour. Audrey served as Officer in Charge of Education at the National Museum of Kenya, Nairobi, and was instrumental in organizing Wildlife Clubs of Kenya. She served on the Field Museum volunteer staff and has done field research and general collecting of plants in Kenya.

For further information on this superb tour, please call or write Dorothy Roder, (312) 322-8862.

unusually abundant. After about twenty minutes of wading chest-deep, I spotted the big butterfly fluttering near a patch of mucuna vines some fifteen meters away. I froze for a moment before slowly approaching it, then had the thrill of watching the morpho place up to twenty eggs, each on a separate leaf of the same vine, before it flew off. I had been at the right place at the right time to witness an event that few biologists have been privileged to see.

The gaudily colored, hairy morpho caterpillars, which emerge from their eggs in about 12 days, are decorated in a rich patchwork of yellows, reds, and brown. They spin thin silken mats to anchor themselves to leaves of the food plant, and take as long as three months to complete their development.

Working high in the mountains of Costa Rica and studying the caterpillars on tagged vines in the wild around the clock, I found that the caterpillars have a distinctive bimodal feeding cycle, that is, with peak feeding at dawn and dusk and very little feeding in between. During the brighter daylight hours, the caterpillars remain immobile, hidden away behind shaded leaves and branches of the food plant. When disturbed, they often emit a pungent, margerinelike odor from a tiny eversible gland just in front of the forelegs. Nonetheless, many caterpillars are victimized by parasitic wasps and flies, which can effectively limit the morpho populations in areas of rain forest.

The fully grown caterpillar then becomes a very mobile green prepupa that wanders about in search of a suitable site to pupate. The plump, green pupa that finally forms is camouflaged among leaves not too far from the food plant. About three weeks later, the magnificent butterfly emerges.

Some morpho species in Central America, such as *peleides*, appear to be "fugitive" species and colonize the secondary vegetation along road cuts and rivers where the larval food plants grow in abundance. The more ecologically restricted *granadensis* and several other species are more closely associated with the undisturbed tropical rain forest habitat. The greatest threat to the survival of these ecologically restricted species is the wholesale destruction of tropical rain forests in Central and South America. □

The subtle earth tones of the lower side of *Morpho peleides'* wings are in sharp contrast to the dazzling iridescence of the upper surface. The butterfly emerged from its pupa only minutes before.

PHILIPPINES
Continued from p. 10

was being checked in the down stream towns; and that so far as Echague was concerned the people there had been visited only with a severe case of what he put in the plural of an ancient, indelicate, but expressive monosyllable. Hence all that is keeping me is the lack of rafts but these I can get in time.

BENEDICT TO DORSEY, NOVEMBER 23, 1907

Laura Benedict, an ex-schoolteacher who had fallen in love with anthropology and had taken courses in the subject at Columbia, was a collector for the Museum who paid her own way to the Philippines. Her semi-amateur status may have kept Dorsey from putting her on the payroll, but he let her use the Museum's name and supervised her as closely as any of his paid fieldworkers.

She seems to have done well among her Bagobo, one of the better known peoples of southwestern Mindanao, but to have had real problems with non-Bagobos. This, her last field letter, was written from Santa Cruz in Davao Province, an area that had recently seen a great expansion of American-owned manila hemp plantations.

The three Ilongot men convicted of murdering William Jones, Nueva Vizcaya Province, Luzon. 1909. N33661

My dear Dr. Dorsey:
Recently I sent you two letters under dates of November 9 and Nov. 11 or 12. They may never have reached you; some of my mail has been tampered with; four boxes of provisions (amounting to $66.00) have been stolen en route; other mysterious things have happened. Sadly enough, it is (almost certainly) not natives, but white settlers, who do these things. Were it not for the Americans and French[1] people, life would be happy indeed, among the Bagobo alone.

In one of those letters I told you that my business of collecting ethnological objects among the Bagobo, was passing under a monoply. This fact becomes daily more apparent, and I might almost say that a syndicate has been formed, including several people, two of them men who can practically control the market for Bagobo treasures; one because he employs the newly-moved Taluu people as his laborers; the other, through his influence as owner of the central American store for Bagobo trade, where they owe large debts, and as the buyer of their hemp.[2]

...While I am laboriously struggling over the distinction between the ears and eyes of the crocodile pattern in the textiles, or trying to extract some information about a little line in the carving of the *tagau*, my neighbor jumps on his horse, sweeps through the hills, and loads in Bagobo objects to the value of hundreds of pesos, in two or three hours.

...I would willingly cooperate with anybody who came to me frankly with a wish to preserve Bagobo records and Bagobo treaures. But it is unfortunate that all this material should be rushed out of the islands without my having chance to see the native owners or the makers, and get points which can never be ascertained in America. Moreover, these men have not taken a straight course: I have given them information, help, friendship, and they are reciprocating with a most contemptible tangle of deceit and cunning.

...If they had only been honest with me, I could plan much better. I often wonder what they could have written you,[3] to explain their

1. The French wife (or mistress) of the American plantation owner, Mr. John.

2. Mr. John raises part of his hemp in his own fields but also buys part of it from Bagobo smallholders in the neighborhood.

3. Benedict states elsewhere in this letter that she suspects Mr. John of shipping his Bagobo material off to Field Museum. In reality, as far as is known, he was not in contact with this or any other museum.

sudden *coup de force*. In the meantime, I ought to be in the mountains, but if I leave my little collection here, some harm would assuredly come to it, and I cannot send it off till I get the pattern names identified, which is a very slow process. For example, every Bagobo woman will say that a little design called *tecco* is just *"batuc ca binububud"* (i.e. purely a conventional or geometric pattern). After several months, some girl will let slip that it imitates the movement of a stream of water as it meanders along. You see how I hate to let the things leave my hands for good and all. Enclosed is the rubbing of a *tagau*[4] which will show you what I am trying to do in one direction of the decorative art. It is slow work, but deeply interesting.

...In closing this somewhat discursive letter I have this to say: If I am correct in my belief (toward which all appearances point) that all these Bagobo things are being shipped to you, on no account let Mr. John or his partners discover that I have written you of what is going on. They think I do not know, and in that lies my safety in being left free to carry on my studies without futher molestation. Burn the letter quietly that I wrote you about one of the agents concerned in this business. If he got wind of it, he would take some swift revenge that might mean harm to my work. I do not know

4. An incised bamboo tube, probably for tobacco.

Ilongot women with heavy loads. Nueva Vizcaya Province, Luzon. Photo by William Jones, 1908. N23375

Ilongot men in mock battle. Nueva Vizcaya Province, Luzon. Photo by William Jones, 1908. N29666

Bag of abaca cloth ornamented with glass and porcelain beads and brass bells, from Mindanao; Bagobo. Lent by the National Museum of Natural History, Smithsonian Institution, Washington, D.C. #387634.

what their grudge can be, nor why they have assumed this hostile attitude. It came like a bolt out of a clear sky, and there is no one who can be trusted to speak on the matter.[5]

COLE TO DORSEY, JULY 25, 1910

Cole returned to the Philippines for his second stint there in 1909 and reached the Davao area, where Benedict worked, in July, 1910. Benedict was in Chicago at the time trying to sell her collection to Dorsey for an amount which, Cole says in another letter, would have been enough to buy large collections from every tribe in Davao Province. In this letter he focuses on another subject.

Wooden food bowl from northern Luzon; Ifugao. 30.3 cm. Collection of Field Museum. #113349.

. . .You will be interested in knowing the straight of Miss Benedict's visit here. She came full of enthusiasm but evidently short of funds. It appears that she proceeded at once to overdo and at the same time starve herself. In order to devote all her energies to the work, she cut herself away from the other Americans and lived in a little hut by herself even when in the civilized towns. In a few months she had ruined her health and her mind could not stand the strain. "The planters were plotting to raise prices on her; later they tried to steal her collection, and finally they had designs on her life. Two old maids from Boston who were also studying the Bagobos were trying to set the natives against her and were also after her notes. After a time, her condition was such that she was removed to the hospital in Davao, but new troubles awaited her here for her enemies attached electric batteries to her bed so she could not sleep, and the wife of the missionary sent her cake and sweetmeats with poison in them. Finally acting on Worcester's advice, the Captain of Constabulary sent her to Manila where her sister took her in charge."[1] The people she most feared are the best people of the district and there seems to have been not the slightest grounds for her suspicions. All agree that she learned more of the Bagobo language and got closer to the people than any other person has done, and it is also their opinion that her collection was exceptionally fine.[2]

5. The next letter clarifies this point.

1. It is not clear whom Cole is quoting, but Benedict's paranoia is amply confirmed by her own letters.

2. She eventually sold her collection, which was indeed very fine, to the American Museum of Natural History.

Stitch-resist dyed men's trousers of abaca *cloth, from Mindanao; Kulaman. 58 cm. Collection of Field Museum. #129645.*

Field Museum's Philippine Anthropological Collection

Although the Cummings Expeditions produced the bulk of the Philippine material at Field Museum, many unrelated acquisitions have substantially strengthened the collection over the years. The most important of these were Dean C. Worcester's gift, sometime in the late 1920's, of some 5,000 negatives of photographs of Philippine tribal areas taken between 1900 and 1910, and Evett D. Hester's 1954-57 gift of some 400 pieces of excavated porcelain from Philippine sites.

The history and nature of the museum's Philippine collection are laid out in the tables on page 32. While the tables speak for themselves, they point to several interesting conclusions that have surprised even members of the Museum staff.

First, Faye Cooper Cole was clearly the champion field collector. Almost half of the total collection was acquired by him personally, and his field notes and photographs form a major part of the excellent documentation we have on our Philippine material. While Dorsey's planning and Cummings' generosity laid the groundwork, it is clear that Cole is the one who made the collection what it is—one of the two finest anywhere.

Second, the collection as listed in Table III has serious gaps, especially as regards the peoples of western Mindanao, of parts of the Sulu Islands, of Mindoro, of northeastern Luzon, and—by far the most significant—of the Christianized central Philippines. The Anthropology Department hopes to begin filling some of these gaps in future years.

Third, it will be noticed that Table II indicates virtually no activity in the Philippines collections between the early 1920s and the early 1950s. This is not a peculiarity of Field Museum's interests but reflects a very general phenomenon: between World War I and II, Americans in the United States almost stopped thinking or writing about the Philippines. Why this happened is not at all clear (most historians of the Philippine-American relations do not even comment on it), but it had major effects on many

Tinguian woman weaving, Abra Province, Luzon. Photo by Faye Cooper Cole, 1907. N29143

fields, including anthropology. No more than a handful of anthropologists set foot in the Philippines between 1910 and 1950, a period which was the golden age of social science in such nearby areas as Indonesia. The result is that we are surprisingly ignorant about such subjects as ethnic arts, oral literature, tribal religions, and even the basic social organization of minority groups. Although anthropological research by Americans and, more importantly, by native Filipinos has revived in recent years, the Philippines remain one of the anthropologically least known areas of the world.

TABLE I
Cummings Expedition Fieldworkers and Collections

Worker and Data	Ethnic Groups	Objects
S. C. Simms, 1906	Ibaloi, Kankanay, Bontoc, Ifugao	1,236
W. Jones, 1906-8	Ilongot	1,275
F. C. Cole, 1907-8	Tinguian, Kalinga, Isneg	2,489
S. C. Simms, 1909-10	Ifugao, Bontoc	1,201
F. C. Cole, 1909-11	Batak, Bukidnon, Bagobo, Bilaan, Mandaya, Kulaman, Tagakaola, etc.	2,256
L. Benedict, 1906-8*	Bagobo	1
F. Gardner, 1909*	Mangyan	163
A. C. Jenks, 1904-6*	Bontoc and Maranao	214

*Fieldwork not financed by Field Museum but field-collected material purchased with Cummings funds.

TABLE II
Gifts and non-Cummings Purchases for Field Museum Philippine Collections

Years	Acquisitions	Objects	Years	Acquisitions	Objects	Years	Acquisitions	Objects
1893-97	0	0	1923-27	0	0	1953-7	4	412
1898-1902	1	213	1928-32	0	0	1958-62	6	46
1903-07	7	361	1933-37	0	0	1963-7	5	35
1908-12	8	219	1938-42	1	1	1968-72	3	10
1913-17	4	138	1943-47	0	0	1973-77	4	21
1918-22	5	20	1948-52	0	0	1978-82	12	126

TABLE III
Field Museum's Philippine Ethnographic Collections, A Partial List

Place	Ethnic Group	Objects	Place	Ethnic Group	Objects
Luzon	Bontoc	777	Mindanao	Bagobo	517
	Ibaloi	373		Bila-an	273
	Ifugao	1168*		Bukidnon	663
	Ilongot	1221		Kulaman	173
	Isneg	174		Mandaya	415
	Kankanay	239		Magindanao	25
	Negrito	486		Manobo	6*
	Tinguian	1232		Moro (Mindanao or Sulu)	103*
	Tagalog and related groups	98		Subanun	1
Mindoro	Mangyan/Hanunoo	91		Tagakaolo	5*
Visayas	Cebuano, etc.	24*		Tiruray/T'boli	22
Palawan	Batak	146	Sulu	Moro	20*
	Tagbanua	80		Samal/Yakan	4
				Tausug	18*

*Known to be an underestimate.

The Museum also has about 800 archaeological items from the Philippines.

Books Based on Field Museum Collections or Expeditions

COLE, FAYE-COOPER

1912 Chinese Pottery in the Philippines.
Fieldiana, Anth. Ser. 12, 1.
42 pp and 22 pls

1913 Wild Tribes of the Davao District.
Fieldiana, Anth. Ser. 12, 2.
203 pp and 75 pls

1915 Traditions of the Tinguian.
Fieldiana, Anth. Ser. 14, 1.
226 pp

1922 The Tinguian.
Fieldiana, Anth. Ser. 14, 2.
489 pp and 83 pls

1956 The Bukidnon of Mindanao.
Fieldiana Anth. Ser. 46.
140 pp and 66 pls

COLE, MABEL COOK

1929 Savage Gentlemen
D. van Nostrand and Co., New York
249 pp

MANUEL, E. ARSENIO

1978 Toward an Inventory of Philippine Musical Instruments.
Asian Studies, Quezon City, Philippines.
82 pp

RIDEOUT, H. M.

1912 William Jones: Indian, Cowboy, American Scholar.
Stokes, New York.
100 pp

Donors to Field Museum Philippine Anthropological Collections

E. E. Ayer
F. Otley Beyer
Irene Brittingham
F. K. Crosby
Fred Evangelista
Louis Fuchs, Jr.
Evett D. Hester
John Hoellen
Joel D. John
Kay Kimberley
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Questions and Answers About the Philippine Show

Why is the exhibit being shown in Chicago?

Because there are 75,000 Filipino-Americans here, because Chicago has a long history of interest in the Philippines, and because it has unusual resources for backing up such a show. No fewer than four major centers of Philippine studies are located in the Chicago metropolitan area: The University of Chicago, Northern Illinois University, The Newberry Library, and Field Museum.

What's in the show?

Ancient gold objects and ceramics, historic Catholic sculpture and paintings, wooden statues, steel swords, brass jars, baskets, jewelry, costumes, and cloth—about 400 objects in all. All represent traditional Filipino rather than American-European workmanship and taste.

Are the objects worth looking at?

Very much so. Each object in the exhibition was chosen by experts as the finest example of its kind after searching through most existing Philippines collections on three continents.

Which objects are the most interesting?

The Manunggul Jar, a registered National Treasure of the Republic of the Philippines and one of the most famous artifacts ever excavated in that country. The Agusan Gold Image, another very famous excavated artifact. A large and fine selection of the *bulul* statues made by the Ifugaos of the northern Philippines; *bululs* are much desired by collectors of ethnic and "primitive" art. The best selection ever assembled of southern Philippines weavings, the greatest of the world's still-undiscovered textile art traditions.

How old are they?

50,000-50 years old. The bulk of the objects date to between A.D. 1600 and 1900.

Where do the objects come from?

The collections of 16 museums and 13 private collections in the U.S., Europe, and the Philippines. About 20 percent comes from Field Museum's own excellent Philippine collections.

Who made them?

Members of 25 ethnic groups ranging from simple headhunters to sophisticated city dwellers. The city dwellers are not necessarily finer artists than the headhunters. The groups with the largest number of objects in the show are the Tagalog/Pampangans, the Ifugaos, the Maranaos, and the Bagobos.

Who organized the show?

A group of experts from the University of Hawaii and the University of California at Los Angeles, under the sponsorship of the Museum of Cultural History of UCLA. Field Museum was closely involved in the initial planning.

Moro fighting knife, Sulu Archipelago. 60 cm. Gift of Walker B. Davis. #115456.

Field Museum's Egypt Tour for Members

Including 11-day cruise on chartered yacht

Del Nord, a U.S. Egyptologist, will lead this tour
For tour price, itinerary, and other information, call Tours office, 322-

Photos courtesy Riley and Corinne Jadwin

FIELD BRIEFS

Fleur Hales

Women's Board Members *Mrs. Robert H. Malott (left) and Mrs. Charles S. Potter and Field Museum President Willard L. Boyd were on hand recently to observe the burying of a time capsule beneath the totem pole in front of the Field Museum. The 55-foot pole, carved by Northwest Coast artist Norman Tait, was raised April 24 to celebrate the opening of "The Maritime Peoples of the Arctic and Northwest Coast" exhibit. The Women's Board raised funds for the commissioning of the pole and for activities during opening week of the exhibit. The time capsule contains names of contributors, staff members, and volunteers who worked on the exhibit, historical information about Field Museum and the exhibit, as well as tools used by the artists who carved the pole.*

Members' Nights October 7, 8

The special evenings that all Members have been waiting for—Members' Nights—will take place this year on Thursday, October 7, and Friday, October 8, from 6 to 10 p.m. As in the past, the festive two-night open house will feature behind-the-scenes visits for all Members to curatorial areas, laboratories, preparators' workshops, and other facilities that are not ordinarily accessible to the public. Curators and other staff will be on hand to discuss their research and the collections with visitors. Live music will be featured in Stanley Field Hall and, of course, refreshments will be served.

Terrell on Leave for 1982-83

John Terrell, associate curator of Oceanic archaeology and ethnology, has accepted an invitation by the State University of New York at Binghamton to be a visiting professor of anthropology for the 1982-83 academic year.

The Department of Anthropology at Binghamton is well-known for research work in human ecology. Terrell says this invitation comes in recognition of his contributions to Pacific Islands biogeography and ecology—subjects featured in his forthcoming book, *Science and Prehistory in the Pacific Islands.*

Ron Testa

EDITH FLEMING
946 PLEASANT
OAK PARK ILL 60302

July, August & September at Field Museum

July 16 through September 15

New Exhibits

"The People and Art of the Philippines." The largest special exhibition of traditional Filipino art to be held anywhere since 1905, with loans from 16 museums and 14 private collections in the U.S., Europe, and the Philippines. The 420 objects were selected to give a comprehensive view of the culture of this former Spanish and then American colony, now a major Southeast Asian nation. Special emphasis is on prehistoric ceramics and gold, Catholic arts of Spanish colonial times, wood sculpture of the northern Philippines, and the extraordinary textiles of the southern Philippines. July 17 to December 31. Hall 26. Members' preview: Friday, July 16 from 1 to 9 p.m.

Continuing Exhibits

"Maritime Peoples of the Arctic and Northwest Coast." Field Museum's newest permanent exhibit compares the ornate cultures from the Pacific Northwest Coast with those of the austere Eskimo societies. Prehistoric origins, history, food-gathering, social life, spiritual beliefs, and art are shown through displays, dioramas, replicas, and films. It's an exhibit you'll return to again and again.

"Exhibitions, Expeditions and Expositions." This photographic essay offers the viewer a behind-the scenes look at the construction of Field Museum's building and of some famous exhibits. On display between Halls 3 and 10.

Hall of Ancient Egyptians. Field Museum's Egyptian exhibit, one of the country's best, has been renovated. You may now enter tomb chapels built more than 4,000 years ago and a chapel replica on loan from the Metropolitan. Other exhibits detail life in prehistoric and early historic eras. Among the most compelling objects in the older area are the mummies. Hall J.

New Programs

"A Philippine Afternoon." Celebrate Philippine traditions by sampling its music, dance, and food at an afternoon of programs designed to coordinate with "The People and Art of the Philippines" exhibit. Highlights include dance performances at 1:30 p.m. and 3:30 p.m. (see p. 11). A 2 p.m. lecture by Dr. Bennet Bronson, curator of Asian archeology and ethnology, will trace the history of Field Museum's outstanding Philippine collection. Free with Museum admission. Sunday, July 18, from 1 p.m. to 4 p.m.

Family Features for July and August. "Raku," a demonstration of ancient Japanese pottery-making techniques. Saturday, July 17, 1 to 3 p.m.; Sunday, July 18, 11 a.m. to 1 p.m.

"Patterns on People." Tour various cultures to discover their concepts of personal adornment, then experiment with *adinkra* stamps on paper and Amazon rolling stamps to decorate yourself. 1:00 p.m., August 14 and 15.

Continuing Programs

Weekend Discovery Programs. New vistas of natural history will be opened to visitors attending these tours, demonstrations, and films. Check *Weekend Sheet* available at Museum entrances for complete schedule and program locations.

Highlight Tours. Special one-hour tours focus on the most popular exhibits. Subjects include ancient Egyptian religion, ceremony and art in Northwest Coast and Eskimo culture, American Indian rituals, and animal behavior as shown in habitat displays. Tours meet at North Information Booth, 1 p.m. Monday through Thursdays, July 6 through August 31.

Dinosaur Days. Two fun-filled days of lectures, craft demonstrations, and tours present the story of dinosaurs, prehistoric mammals, and armored fish. Make fossil rubbings of a flying pterosaur, draw giant dinosaur murals, create floating specimens, play "Pin the Bone on the Dinosaur," or mold dinosaurs out of clay. Saturday and Sunday, September 11 and 12.

Museum Hours. Field Museum is open daily, including Saturdays and Sundays, from 9 a.m. to 5 p.m. The free day is Thursday.

Library Hours. During July, August, and September the library will be open weekdays from 9 a.m. to 4 p.m. Closed Labor Day, Sept. 6. To visit the Museum Library, obtain a pass at the reception desk, main floor.

Museum Telephone : (312) 922-9410.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

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Egypt Tour for Members

January 7-26, 1983

$4,100, double occupancy

An unforgettable visit to the land of the pharaohs, including an 11-day Nile cruise aboard a chartered yacht. The tour leader is Del Nord, a distinguished U.S. Egyptologist. For details, write Field Museum Tours, Roosevelt Road and Lake Shore Drive, Chicago, IL 60605, or call Dorothy Roder at the Tours office, 322-8862.

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Monolithic gateway to Kalasasaya, principal temple of the ancient Andean city of Tiwanaku. See "Tiwanaku: Portrait of an Andean Civilization," p. 13. Photo by Alan L. Kolata.

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FIELD MUSEUM OF NATURAL HISTORY
1982 HOLIDAY CARD

Actual size: 6-5/8" x 5-1/8"
Order form and price schedule on reverse side.

The Women's Board of Field Museum is pleased to announce that a special holiday card will be available for your 1982 holiday greetings.

The first in a collector's series to be offered, this beautiful full-color scene is adapted from one of the treasures in the Museum's Mary W. Runnells Rare Book Room.

Printed on fine quality ivory paper stock with matching envelope, the card may be ordered with the following greeting: "Warmest wishes for the holiday season" printed in a festive forest green. For those who prefer to use the card for personal notes or for invitations, it is available without the greeting.

Proceeds from the sale of the card will benefit Field Museum.

Your order benefits Field Museum. Thank you!

PRICE LIST	50 CARDS	75 CARDS	100 CARDS	EACH ADDED 25 CARDS
*With name imprint (one line)	$24.00	$34.50	$45.00	$11.25
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*Optional printed envelope (2 lines)	5.75	6.25	6.75	.75

*Add $1.00 per order for extra line printed on card or envelope. Printed orders not accepted after December 1. Please allow four weeks for delivery. For information: (312) 322-8870.

I would like to order:

_____ holiday cards, with name
_____ holiday cards, without name
_____ plain cards, no greeting

Please imprint name on card as follows:

_____
_____

Please imprint address on envelope as follows:

_____
_____
_____

Ship to:

Name _____
Address _____
City _____ State _____ Zip _____
Daytime Telephone _____

Add for shipping and handling:

50 to 100 cards	$2.00
100 to 300 cards	$3.00
over 300 cards	$4.00

Card total: $_____
Sales tax (7%): $_____
Printed envelopes: $_____
Shipping and handling: $_____
Check enclosed for: $_____

Please return check payable to Field Museum and order to:

Holiday Cards
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605-2496

The proceeds from the sale of this holiday card benefit Field Museum and one-half of the purchase price is tax deductible. We are unable to extend the usual 10% discount to Museum members.

Members' Nights

October 7 and 8

6:00-10:00 p.m.

Have you ever wanted to make your own fossil fish? Or learn about scorpions, centipedes, and spiders? Then be sure to come to Members' Nights on Thursday, October 7, and Friday, October 8, from 6:00 to 10:00 p.m. (Third floor opens at 7:00 p.m.)

Entertainment for Members' Nights will feature the Natyakalalayam School performing dances from India, under the direction of Hema Rajagopalan. These young girls in native costumes perform both pure and expressional dances which are as graceful as they are intricate. Well-received at our Asia festival, they are sure to delight both youngsters and adults.

Another act, featured at our Asia Festival and returning by popular demand, is Han Hua So, the amazing 16-year-old Chinese acrobat. This young woman, who amazed us with her "Bowl Balancing" act, will again perform her dazzling feats in Chinese ballet gymnastics.

Appearing from Chicago's Degerberg Academy will be Nate Defensor and Jim Wauchon, who will demonstrate Philippine martial arts. Sticks, knives, and swords as well as the open hand are used in these arts, which have been described as the most highly developed weapons arts in the world. Passed from generation to generation, they were banned in the Philippines 400 years ago but are today enjoying renewed popularity. The demonstration will keep you spellbound!

Other evening highlights include:

Ground Floor: Serpent Slide Show; Miniature Monsters of the Deep; Make Your Own Family Totem Pole; Animal Camouflage; Collection Showcase on Slides: Malvina Hoffman and Indian Art of the Northwest Coast.

First Floor: Totem Poles, Masks, and Shamans; Pin the Bone on the Dino; In Search of Strange and Unusual Pets; Your Name in the Egyptian ABC's.

Second Floor: Members' Preview of "The Last and First Eskimos" (a photographic exhibit); "The People and Art of the Philippines," our current traveling exhibit.

Third Floor: Architectural Curiosities; Art, Death and Life in New Ireland; Make Your Own Fossil Fish; Scanning Electron Microscope: Vision into the World of the Tiny; Plants of the Bible.

Fourth Floor: Various Aspects of Exhibit and Graphic Design; Silk-Screening Demonstration; Exhibit Production.

Free parking is available in the north Museum lot and the Soldier Field lot. Or use the free round-trip charter bus service between the Loop and the Museum's south entrance. These CTA buses marked *Field Museum* will originate at the Canal Street entrance of Union Station and stop at the Canal Street entrance of Northwestern Station, Washington and State, Washington and Michigan, Adams and Michigan, and Balbo and Michigan. Buses will run circuits beginning at 5:45 p.m. and continue at 15-minute intervals until the museum closes. (Buses will travel to the train stations until the departure of the last train. Please check your train schedule for the exact times.)

Reasonably priced dinners and snacks will be available in the Museum food service area from 6:00 to 8:00 p.m.

To achieve a more even distribution of visitors, we suggest you follow this alphabetical schedule:

A through L: Thursday, October 7
M through Z: Friday, October 8

Admittance will be by invitation, so please retain your Members' Night invitation and present it at the door for admittance for you and your family.

We look forward to seeing you!

The schooner Bowdoin *in Nain, Labrador, harbor.*

The Rawson-MacMillan Subarctic Expedition of 1926

Field Museum's first expedition into the Far North

by DAVID M. WALSTEN

Frederick H. Rawson, Sr. sponsored the 1926 expedition as well as a second one to the same general region in 1927-28. He served as a Museum trustee from 1927 to 1935.

"MacMillan expedition," wired Field Museum president Stanley Field on April 15, 1926, "contemplates visiting Labrador, Greenland, Baffin Land to investigate pre-Columbian Norse ruins, make general collections in ethnology, zoology and geology, which would result in adequate representation of the life of the Eskimo and arctic mammals, birds, fishes, minerals, these being deficient in Field Museum at present . . . . Desire to emphasize my great personal delight and satisfaction if you will accept this invitation to become sponsor of the expedition and benefactor of the Museum."

The recipient of the telegram, Frederick H. Rawson, Sr. (on vacation in Florida), wired back: "As an evidence of my regard for high position Museum has reached as an educational center as well as housing priceless collections most of which has come about through your great executive management and aid will be glad to sponsor MacMillan expedition. . . ."

As the result of Rawson's benefaction, Field Museum's first collecting venture into the far

North was on its way to becoming a reality. Two expeditions were actually to take place, acquiring more than 9,000 specimens for the Museum's collections.* Perhaps equally important were the observations Field Museum personnel were able to make in regions that had seldom or never before been visited by scientists.

At the time of his decision to underwrite the expedition, Frederick Holbrook Rawson (1872-1937) was chairman of the board of the Union Trust Company of Chicago. In 1927 he was named a trustee of the Field Museum, serving in that post until 1935. After Union Trust's merger with the First National Bank of Chicago, Rawson became First National's board chairman. Subsequently he founded and was chairman of the board of the Mercantile Trust and Savings Bank.

Over a period of nearly half a century, expedition leader Donald Baxter MacMillan (1874-1970) accompanied or led numerous expeditions to Arctic and subarctic regions, beginning with the Peary Arctic Club Expedition of 1908-09. His final trip to the Arctic was in 1957 at the age of 82.

The Field Museum *Annual Report* for 1926 summarized the expedition's itinerary:

"The expedition sailed from Wiscasset, Maine, June 19, in Commander MacMillan's auxiliary schooner "Bowdoin," accompanied by Commander Rowe B. Metcalf's auxiliary schooner "Sachem." Along the coast of Maine stops were made at various ports, the last being Bar Harbor. On June 28, they arrived at Sydney, Nova Scotia, from there sailing to Curling near the head of Bay Island, Newfoundland.

"Battle Harbor, their first port in Labrador, was reached July 3, and there a delay of three days was caused by ice and weather conditions. While sailing northward in the more open waters near the barren rocky coast, eleven stops of varying length were made in Labrador. On July 20, they arrived at Cape Mugford where, the conditions appearing favorable, they changed

The schooner Sachem, *shown off Newfoundland, accompanied the* Bowdoin.

Rawson was also sponsor of the 1929 Rawson-Field Museum Ethnological Expedition to West Africa.

Aboard the Bowdoin *were (l. to r.): Ralph Robinson, mate; Ashley Hine, taxidermist; Kennett Rawson, boatswain; Paul McGee, radio operator; John Janes, engineer; Alfred C. Weed, ichthyologist; Donald B. MacMillan, captain and owner; Dick Salman, second mate; Dr. Thomas, physician; William Boogar, cook; and Joseph N. Field, cabin boy. Rawson, then 15, is today a New York publishing company executive; Field, a Field Museum trustee since 1934, lives in California.*

Left: *Stanley Field, Field Museum president 1908-64.* **Right:** *D. C. Davies, director of Field Museum 1921-28*

their course, passed through the ice pack off the coast of Labrador and in a few hours, were in the open waters and headed for Greenland.

"The first landing place in Greenland was at a little bay south of Sukkertoppen. Sailing northward, they visited Sukkertoppen, Akpamiut, South Strömfjord and Simuitak. About noon of August 1 they arrived at Godhavn, Disko Island, the farthest point north reached by the expedition, and on the following day they began to sail homeward. On the return trip, along the west coast of Greenland, they stopped at Egedesminde, Holstenborg, and Sukkertoppen, but at the last mentioned place only long enough to load oil before sailing for Baffin Land.

"Reaching Baffin Land in a fog, they anchored in a little harbor behind Cape Haven and as soon as they were able to locate their position, August 15, they sailed for Labrador. A number of ports were again visited along the coast of Labrador as well as in Nova Scotia and Maine,

Frederick Rawson's yacht Gadfly *motored up to Wiscasset to see the expedition off.*

and on September 11, twelve weeks after they started northward, the expedition returned to Wiscasset, Maine."

According to an Associated Press story that appeared in newspapers at the time of the *Bowdoin's* departure, the Rawson-MacMillan venture was one of only two Arctic expeditions to be made that year (among 11 planned by six nations) with scientific research as the sole purpose. It was MacMillan's tenth journey into the Arctic in 18 years.

Field Museum's representatives on the 1926 expedition were bird taxidermist Ashley Hine and assistant curator of fishes Alfred C. Weed. James H. C. Martens of Cornell University went along to collect geological specimens for the Museum. Frederick Rawson's 15-year-old son, Kennett, and Stanley Field's 14-year-old son, Joe (now a Field Museum life trustee), were the *Bowdoin's* boatswain and cabin boy, respectively.

Since radio technology was still in its infancy, radio messages between Field Museum and the expedition were for the most part brief and reception was often poor. Chicago-based Zenith Radio Corporation, which donated short wave radio equipment for the *Bowdoin* as well as a radio operator, also assumed the responsibility for relaying messages between the schooner and Field Museum. Zenith president E. F. McDonald, Jr. wrote Museum director D. C. Davies on July 14 that his operator on the *Bowdoin* could "send messages only on Tuesday, Thursday, and Saturday nights, while they are in port. The reason for this is that two ships

in the same harbor cannot send and receive at the same time. They can do this only when at sea, and the ships widely separated." (The schooner *Sachem* was also equipped with radio equipment.)

Nonetheless, radio messages came through with regularity, so Museum president Stanley Field, director D. C. Davies, and sponsor Frederick Rawson were able to follow closely the expedition's progress. Short wave operators in California, Wisconsin, New Jersey, Massachusetts, and other areas picked up messages from the *Bowdoin* that routinely reported matters such as weather and ice conditions, landfalls, and collecting activities ashore. There were also emergencies:

A July 13 radiogram from MacMillan to Davies read: "Held here [Indian Harbor, Labrador] . . . for two days by bad easterly gale. Fine weather today, but ice packs extend as far east and north as eye can reach. Waiting for westerly wind to drive it off the coast. Dr. Thomas [*Bowdoin's* physician] called upon to assist today in emergency [appendectomy] upon 16-year-old girl in one of four schooners in harbor. Operation successful. Scientists hard at work."

MacMillan to Davies, July 19: "Anchored tonight in Port Manners in North Labrador. Shall examine tomorrow what Eskimos declare are Norse ruins. May leave for Greenland tomorrow night."

MacMillan to Davies, July 20: "Visited land off northern Labrador coast and examined what are declared by the Eskimos . . . to be the former home of the stranger people [?] who came to sea in boats a long time ago. These ____ are called by them Tunit. There are traditions here that these Eskimos fought with the Norsemen and killed some of them.

"I have learned of other places where the old Norsemen lived and I shall visit them on my return from northern Greenland in August. The houses six in number consist chiefly of tumbled down masses of glacier boulders and resemble foundations of wooden houses roughly rectangular in shape. Near these were several straight walls which may have been built by the Norsemen against the Eskimos. With all these findings anywhere in North America there is really no absolute proof that these are Norse ruins.

"Further and more careful work is necessary.

"In this last part [reported the operator who took the message] it was impossible to catch many words of the message but by piecing it together somehow I learned that the *Bowdoin* with a boat by its side which is called *Sachem* are proceeding toward Greenland and expect to get there by next Friday morning. The crew is feeling fine and says to give their regards to their friends through the press."

Aboard the Bowdoin *on "Masquerade Day," (l. to r.): Rawson, Weed, Janes, Field, Thomas, Salman, Robinson.*

Ashley Hine to Museum taxidermist Leon Pray, July 26: "You would enjoy the delightfully charming scenery along the coast of Labrador. Thousands of islands, beautifully tinted icebergs, and never saw such sky effects. This country surely is an artist's paradise. Reached Sukkertoppen today."

MacMillan to Davies, August 2: "Crossed Arctic Circle last night. Now at Disko, our objective. . . . Plan to start back within few days after visiting Ritenbank and Greenland's most active glacier at Jacobshaven, obtaining here samples of coal and native iron."

Joseph N. Field to Stanley Field, August 10: "Am sorry have not sent you a message for so long. Am having a wonderful time dancing with the pretty Greenland girls at Holstenborg."

J. Field to S. Field, August 12: "We reached Sukkertoppen today. . . . Why didn't you talk to us from WJAZ Zenith Radio Station last night? Tell *American Boy* that I will not promise to write for them but I will try it."

J. Field to S. Field, August 16: "In Baffin Land yesterday. Lots of ice. Abbie (Abie Bromfield, expedition interpreter) killed 1,500-pound walrus today."

Hine to Wilfred Osgood, chairman of the Department of Zoology, August 23: "Meeting with good success have . . . fine series of snow bunting, Lapland long spur, wheatear, etc. American eider, surf scoter, and black mallards in the total eclipse beautiful, white and gray gyr falcon and downy young, also glaucous and iceland gulls and ptarmigan immatures . . . and

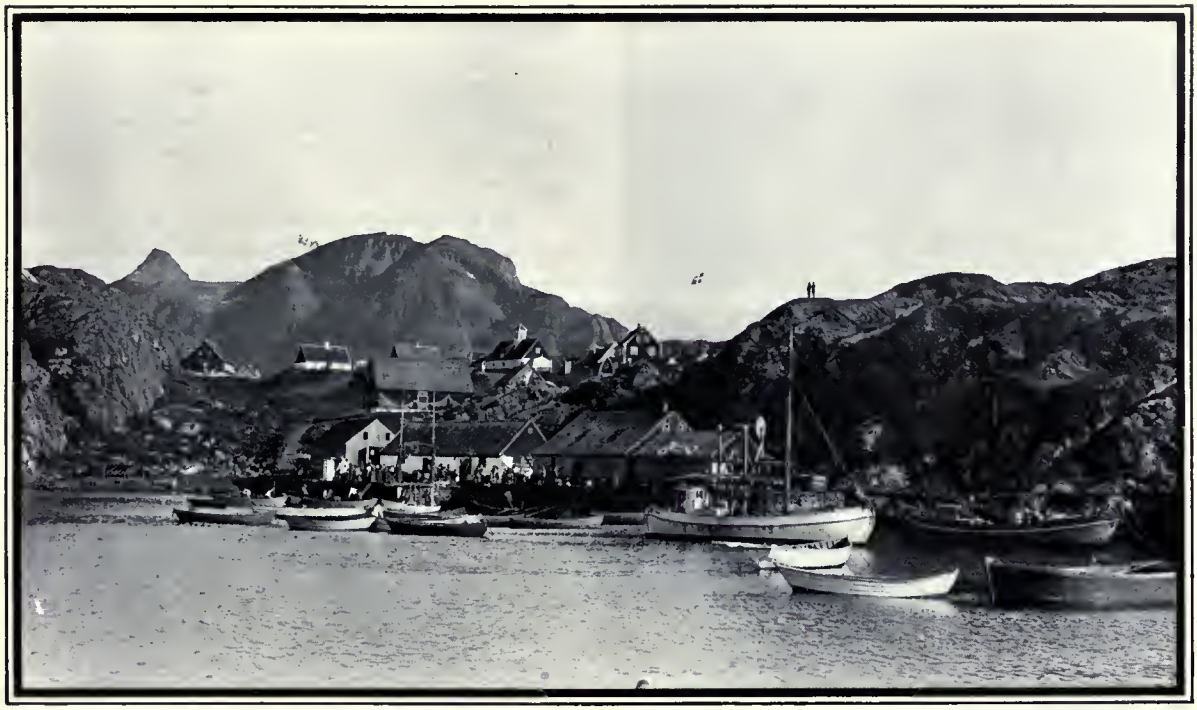
Left: *John T. Crowell, Jr., captain of the* Sachem, *with Eskimo visitors.* **Right:** *Bosun Ken Rawson.*

I have made satisfactory color sketches of all. I find the days too short for there is much to do, work which cannot be postponed, small mammals are scarce but we have a number of fine specimens for study and exhibition, today the warmest for six weeks . . . 75 [degrees] mosquitoes and black flies are working over time and are wonderful eye, ear, nose, and throat specialists, the Eskimos are very interesting and nice people to know . . . Iceland gulls were feeding on blueberries, we landed a nice walrus . . . aurora borealis at close range are delightfully interesting. . . ."

J. Field to S. Field, August 24: "We are at Jack Lane's Bay Labrador hunting and enjoying ourselves in every way possible. We should reach Christmas Cove September 10. Hope you and Mother meet me there and run on to Wiscassett with us".

Hine to Osgood, August 28: "*Bowdoin* now working up and down Jack Lanes Bay. Today the ship seems deserted with most of the crew ashore engaged in hunting or exploration. Would like very much to have gone with the boys but an abundance of skins means plenty of

Left: *Joe Field takes his turn at the wheel.* **Right:** *Eskimo carving found at Kugsuak, South Strömfjord, Greenland.*



Holstenborg, Greenland

work for me at the bench. You would enjoy the contrast between my *Bowdoin* studio and the one I had grown so accustomed to at the Museum. Space in our limited surroundings here is a prized possession. However, I have my own little spot twixt radio and ice box. Battery boxes support a bit of panel board which comprises my desk. On the wall, bulkhead they call it, everywhere are pinned my notes and sketches. Birdskins packed in every conceivable nook and corner, when the ship rolls as in heavy seas, bird skins and radio fly together so Sparks remarks. A jolly crew though and all happy in the thought of our timely return. . . ."

Hine to U. A. Dohmen (head of Museum's Division of Printing), September 4: "Anchored on account of fog, rain and cold weather help to make conditions more unpleasant. It does not

Taxidermist Ashley Hine with one of his sketches

Captain "Mac" shares George Catlin's book on Indians with Naskapi friends.

seem possible the summer has slipped by. We still have about us odd shaped icebergs with their beautiful tints of pale blue, green and violet. They are so interestingly beautiful, they almost seem to speak to one. . . ."

A week later the *Bowdoin's* weary but happy crew stepped ashore again at Wiscasset, Maine.

On September 13 Stanley Field wrote to Commander MacMillan about Joe: "I am delighted with what this trip has done for Joe. Physically and mentally he is a changed boy and was broken hearted at leaving the *Bowdoin* and the crew. He is crazy to go on another expedition with you. The trip did wonders for him. . . ."

Field also expressed his pleasure with the scientific results of the venture and with the quality of MacMillan's leadership.

MacMillan replied: "It is very gratifying to me to learn that the results of the Rawson-MacMillan Museum Expedition of 1926 are most satisfactory to you. . . . I feel, in view of the fact that our expedition was limited to the brief period of three months, which in reality means a two-months working period, . . . that our scientists, in spite of being seriously handicapped by narrow quarters on board ship, did extremely well.

"After 19 years of Arctic work, the truth is more pronounced than ever that ample and really valuable results along certain lines cannot be obtained during the summer months. . . . Because of ice conditions in the Eastern Arctic regions, a ship cannot reach [islands there] until the 15th of July and even August 1st. By this time the birds have changed their mating plumage, the eggs are hatched, the young . . . are gone. Early spring flowers are withered thus

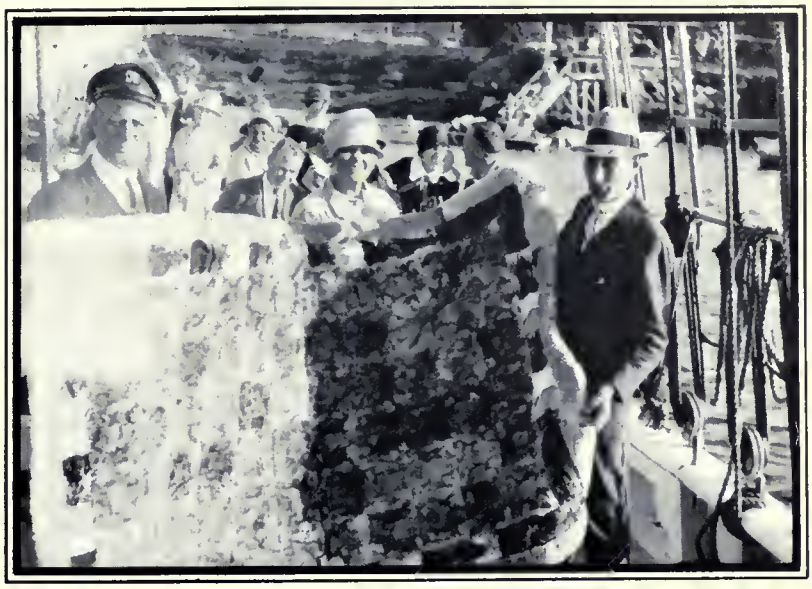
Icebergs viewed from Bowdoin off Labrador.

making botanical data incomplete and therefore of little value scientifically. . . .

"Facts pertaining to northern animal life obtained and noted during the short-summer season, are misleading . . . Summer observations are not enough. The work should be continued throughout the year . . . human life . . . is also much different among the Eskimos and Nascopic Indians . . . in summer than in winter.

"Therefore, to make a full and complete study, . . . the period of work should continue at least for 15 months from date of departure to date of return."

MacMillan was successful in making his point. The following year, 1927, he was to lead a second Rawson expedition. It was to last, as he proposed, for fifteen months. □



Stanley Field (rt.), Mrs. Field, and Captain MacMillan admire birdskin mat from Sukkertoppen, Greenland, following the arrival of the Bowdoin *at Wiscasset on September 11.*

The Museum's annual report for 1926 summarized the results of the expedition:

Although the Rawson-MacMillan Subarctic Expedition was conducted in the interest of the Museum as a whole and not primarily in behalf of the Department of Zoology, nevertheless it was the means of adding many new and desirable specimens of vertebrate and invertebrate animals to the Museum's collections.

. . . collecting was done, whenever possible, in all of the harbors visited. In this work the members of the passenger crew gave much valuable . . . assistance. Those who were fond of shooting obtained a sufficient number of birds to keep Mr. Hine busy skinning and making color sketches. Wherever trips ashore could be made, collecting was done in streams, ponds, and tide pools. . . . It was of much interest to discover fishes living in many landlocked ponds high up on the islands along the coast of Labrador. As some of these ponds apparently freeze solid in winter, the question arises as to how the small species of fish manage to survive.

The 1,811 zoological specimens obtained . . . include: mammals, 52; birds, 158; bird eggs, 28; fishes, 642; insects, 260; and invertebrates other than insects, 671. [These are] of particular value in that the Museum had previously very few specimens from Labrador and Greenland . . . a large proportion of the birds obtained are water birds, . . . urgently needed for the proper re-installation of the exhibit of North American birds now under way. One of the birds that is especially desirable is the Greenland Wheat-eater, a species formerly not in the Museum's collection. . . .

An interesting collection of 100 well-prepared specimens of Greenland plants was made by Mr. A. C. Weed. . . .

Wherever a landfall was made [geologist James Martens] secured representative rocks and minerals. Some of the localities visited, . . . have never been previously reported on by geologists. . . . As far as possible, large specimens, suitable for Museum display were obtained. These chiefly illustrate rock structures and such . . . phenomena as dikes, veins, folds and ripplemarks. . . .

At two localities in Maine sets of specimens representing the principal formations outcropping were collected. . . . In Nova Scotia, . . . good slabs of ripple-marked sandstone were obtained from Sydney, a specimen of conglomerate from near Baddeck, gypsum from the white cliffs at Big Harbor and glacieted pebbles from St. Peter.

Near Curling, . . . Newfoundland, . . . specimens were collected ilustrating the development of rock cleavage and jointing, the formation of veins, and some showing . . . materials . . . mined at the slate, limestone and quartzite quarries of the region.

Many localities in Labrador were visited. . . . With the exception of some loose sands and gravels on the surface, all of the rocks . . . were found to be very ancient and to contain no fossils. From these localities were collected large specimens of . . . gneiss which show jointing, foliation, banding and folding. Trap dikes were found at nearly every harbor, and specimens were collected to show columnar and irregular jointing and the increase in size of the mineral grains from the margin of the dike toward the center. . . .

Some mineral specimens were also collected in Labrador: chatoyant labradorite, . . . hypersthene, . . . serpentine, . . . actinolite, . . . albite and potash feldspar. . . . In Greenland . . . the rocks were found to resemble those of Labrador, being mostly gneisses with trap dikes. In South Stromfjord . . . a locality yielded . . . soapstone such as is used by Eskimos for stoves or lamps. Specimens of talc and asbestos were also obtained.

On Disko Island, specimens were collected from the Tertiary volcanic rocks. . . . Most of them contain zeolites in cavities. . . . Specimens of native iron of Disko Island were obtained from the Eskimos. Two specimens of sand obtained from Holstenborg showed the effects of sorting by waves, the sand being separated into a heavy portion, consisting largely of garnet and a light one which is nearly all quartz and feldspar. At Baffin Island, a short stay . . . prevented collecting anything more than some pieces of banded gneiss. . . .

The total number of geological specimens collected was 579, and the number of geological photographs made was 181. . . .

Dinosaur Days

Saturday and Sunday, September 11 and 12
11:00 a.m.-4:00 p.m.

What happened 65 million years ago? Did a star explode, exposing our planet to such immense radiation that the earth's ozone layer was burnt off, or did a huge asteroid collide with our planet, darkening the skies with debris that made further life impossible for many species? These are but two of many theories about dinosaurs. Regardless which proves correct the result was the same—the complete eradication of the greatest and most mysterious of all creatures—the dinosaurs!

Our investigation of these wondrous reptiles is relatively recent, dating from the first published descriptions in England in 1824, which identified the "great fossil lizard of Stonefield." Before that, dinosaurs did not exist for us.

Come to Field Museum September 11 and 12 to find out about these ancient reptiles that ruled the earth for 140 million years. Enter Stanley Field Hall, decorated for this annual celebration with an arcade of murals of "unsung creatures": dueling archaeopteryxes, a flying pteranodon, the duck-billed hypacrosaurus, and more. Slide lectures, films, craft projects, performances, and self-guided tours breathe life into dinosaurs, armored giants of the seas, and fossil mammals.

A special program, "Fantasy Dinosaurs on Film," will be presented at 2:00 p.m. on Saturday by Donald F. Glut, author of *The Dinosaur Scrapbook*. With the aid of film clips from dinosaur classics, Mr. Glut will show how movie dinosaurs are created and animated. Slide lectures designed to expose the newest theories include: "Ancients of the Deep: Fossil Fishes," "Sauropods—the Ultimate Dinosaurs," "Cope and Marsh: the Saurian Scandals," "Dinosaur Update—New Discoveries," and a slide tour of the life and work of Charles Knight, the artist who painted the historic murals in Field Museum's Hall of Dinosaurs.

Children can enter the world of dinosaurs by visiting the "Hadrosaur Habitat," a total environment that recreates the sights and sounds of the living world of dinosaurs. A costumed *Tyrannosaurus rex* relates to children many tales, including that of an ankylosaur in search of water and of a forest fire during dinosaur times.

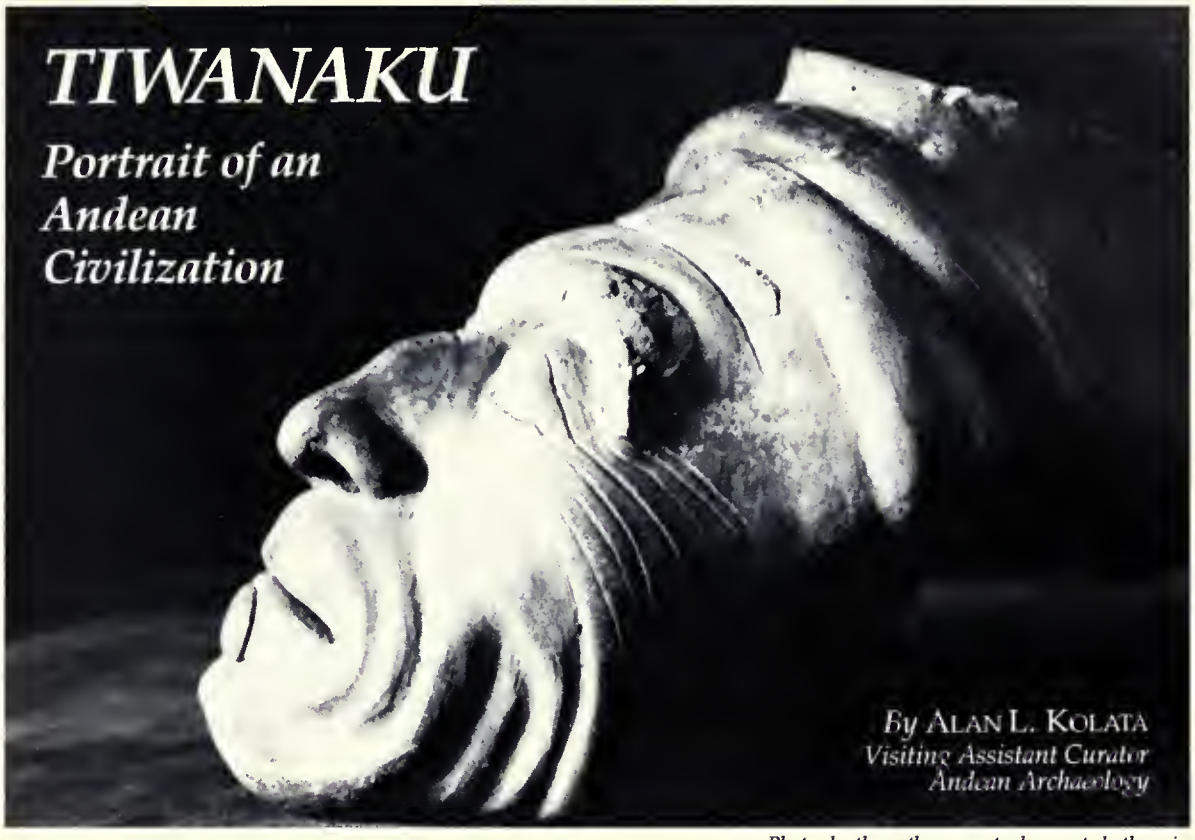
Join us on the sidewalks on the north side of Field Museum to create a giant dinosaur mural in colored chalk, or view a coelacanth, the recently discovered lobe-finned fish once thought to be extinct for millions of years. The entire family can enjoy special performances by synthesizer artist Doug Babb who, with the audience's help, creates a "Prehistoric Soundscape"—a symphony of "dinosaur sounds."

The second annual "Dinosaur Days" promises to be exciting and information-packed for dinosaur enthusiasts of all ages. The programs are free with admission to the Museum—no tickets required. A schedule of activities will be available at all Museum entrances on "Dinosaur Days." For more information call (312) 322-8854.

Zbigniew Jastrzebski

TIWANAKU

Portrait of an Andean Civilization



By ALAN L. KOLATA
Visiting Assistant Curator
Andean Archaeology

A remarkable ceramic rendering of a trophy head discovered by Bolivia's Institute of Archaeology at Kalasasaya, Tiwanaku's principal temple. This stunning portrait is emblematic of the sensitivity and sophistication of the plastic arts produced in the great civilizations of the ancient Andean world.

Photos by the author except where noted otherwise

PRELUDE

The Spanish chroniclers following in the wake of the destruction of Tawantinsuyu, the vast imperial realm of the Inca, inquired about the origins of that great conquering nation from Cuzco. They were invariably told that the first Incas emerged in the south, in the land the Inca called Collasuyu. This Inca myth of origins derived, in part, from an ancient native belief in the sacred character of Collasuyu's Lake Titicaca, the largest body of water in the Andean uplands.

More importantly, this myth reflected the key economic and demographic position that Collasuyu held in the political composition of Tawantinsuyu. It was not simple coincidence that the great king Pachakuteq (A.D. 1438-70) initiated the Inca regime of imperial conquest by moving against the native Aymara kingdoms of the Titicaca basin.

From both archaeological and ethnohistoric evidence, we know that two of the most powerful of these Aymara kingdoms were centered on the western shores of Lake Titicaca. One of these nations was the Colla, who built their capital, Hatuncolla, to the north of the modern Peruvian city of Puno. The other lake kingdom, a bitter rival of the Colla, was the Lupaqa, who ruled from the town of Chucuito to the south of Puno.

The economic foundations of these two kingdoms were conditioned in part by landscape and environment. These two states evolved on the Andean high plateau, or *altiplano*, situated between two great mountain chains: the Cordillera Occidental in Peru and, to the east in Bolivia, the towering Cordillera Real. The *altiplano* is a cold, windswept environment subject to a marked alternation between dry and wet seasons. During the wet season, generally November to March, frequent torrential rains cause periodic changes in the levels of the many lakes in the Titicaca basin, including that of Lake Titicaca itself.

The topography, elevation, and attendant cold climate of the *altiplano* severely constrain the agricultural inventory of the Titicaca basin: only hardy tubers such as potato, oca, ulluco, and mashwa, and the unique cold-adapted chenopod grains, quinoa and cañiwa, can be readily cultivated in this dour environment. These crops were cultivated intensively in pre-Columbian times. They continue to play a prominent role in the diet of the modern inhabitants of the *altiplano*.

Despite these environmental limitations on the agricultural regime, when even limited plant cultivation was combined with large-scale herding of llama and alpaca, the biotic potential of the Titicaca basin was enormous. The large indige-

Major portions of this essay are excerpted from Dr. Kolata's article, "The Evolution of Civilization in the South Andes," which will appear in Ancient South Americans, *Jesse Jennings, editor. W. H. Freeman and Company Publishers, San Francisco.*

nous population and political importance of the *altiplano*, as mirrored in the powerful Colla and Lupaqa kingdoms, attest to this essential fact of Andean cultural geography.

Without doubt, the cornerstone of the *altiplano* economy was camelid pastoralism. Sixteenth-century documents from the Lake Titicaca region reveal that the Aymara kingdoms controlled immense herds of llama and alpaca. Some wealthy nobles owned up to 50,000 animals and the total camelid population for this region probably exceeded 500,000.

These enormous herds were grazed in *sierra* basins above 2,500 meters and on the cold semi-arid grasslands of the *puna*. The vast, gently undulating zone of the *puna* lies above the effective limits of intensive agriculture. Without llama and alpaca intermediaries, this important zone would have had little economic value for man. Without pastoralism, the economic and demographic power base of Collasuyu would have been greatly diminished.

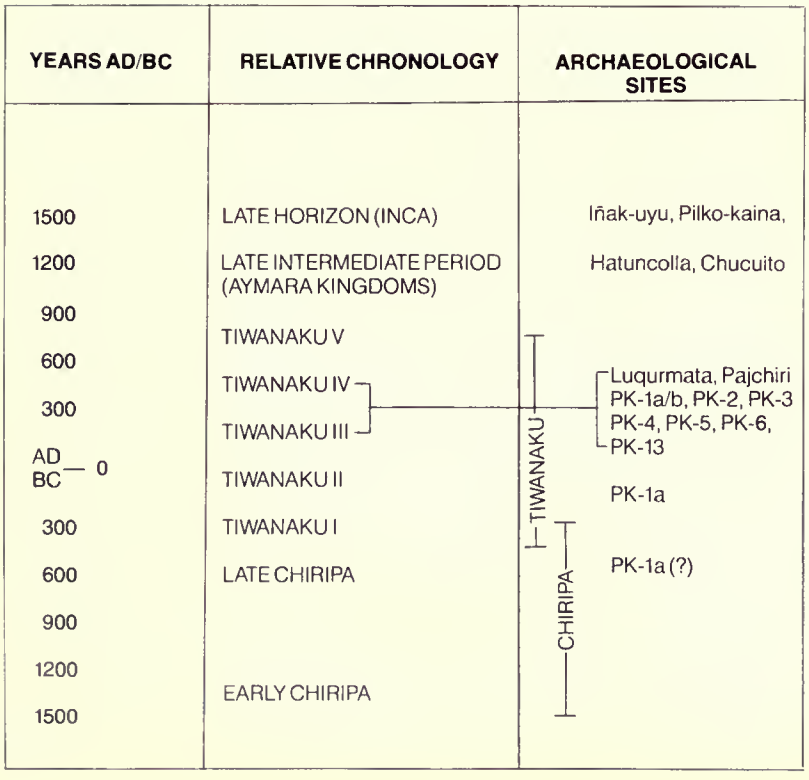
The llama and alpaca were bred carefully, primarily for their wool, which was woven into a variety of textile products: tunics, bags, hats, slings, and the like. The textiles, in turn, were directly used as clothing, exchanged for food and other products, or used to discharge social obligations. Secondarily, these Andean herd animals were a readily available source of meat and could themselves be exchanged for other food products. Finally, the llama was used for millennia in Collasuyu as an efficient pack animal. Llama caravans made up of as many as 2,000 animals carried a wide array of food products, textiles, pottery, and metals throughout Collasuyu.

It is this latter use of the llama as pack animal that allowed the kingdoms of the Titicaca basin to expand their economic universe beyond the confines of the *altiplano*. Caravans from the highlands journeyed hundreds of kilometers to the *selva* on the eastern slopes of the Andes as well as to the Pacific coasts of Peru and Chile. In these warm lands of lower altitude, the highlanders obtained coca, maize, tropical fruits, pepper, dried fish, medicinal plants, and other goods not available in their colder homeland.

The warm-land products were acquired through trade, but also more directly through colonies established by the highlanders on the Pacific coasts and in the valleys of the *selva*. The Lupaqa, for instance, had colonists working lands in the coastal valley of Moquegua in extreme southern Peru. This uniquely highland Andean system of directly exploiting distant lands at lower altitudes could not have functioned without the camelid caravans. The large pack trains of llamas transported the desired exotic goods from the colonies back to the *altiplano* homeland. The caravans also served as the primary vehicle of communication between the colonists, who lived in potentially hostile foreign lands, and their *sierra*-based kinfolk and compatriots.

Just prior to their conquest by the Inca, then, the kingdoms of the Titicaca basin operated three remarkably rich economic systems: (1) intensive cultivation of tubers and chenopod grains in the *altiplano* homeland, (2) extensive herding of llama and alpaca, and (3) farflung networks of trade caravans and colonies in the warmlands to the east, west, and south of the *altiplano*. This productive tripartite economy was not an invention of the late pre-Hispanic kingdoms. On the contrary, these interrelated economies had far more ancient roots in Collasuyu.

When Pachaquteq moved first to conquer the kingdoms of Lake Titicaca, he was acknowledging that Collasuyu held the economic and demographic key to his nascent empire. Once the Inca secured the Titicaca basin, their armies naturally marched down the ancient caravan routes to the coasts of southern Peru and northern Chile, to the *selva* of eastern Bolivia and into the uplands of northwestern Argentina. Over one thousand years prior to the advent of the Inca, these same routes to empire were followed, and most probably created by one of the greatest native states of the ancient Americas: Tiwanaku. Ironically, despite its seminal role in the rich and complex cultural history of the Andes, Tiwanaku is perhaps the least understood pre-Columbian civilization of the New World. As with any "mys-



Vista of the Bolivian altiplano *with the towering Cordillera Real in the background and contemporary farmer's fields in the foreground.*

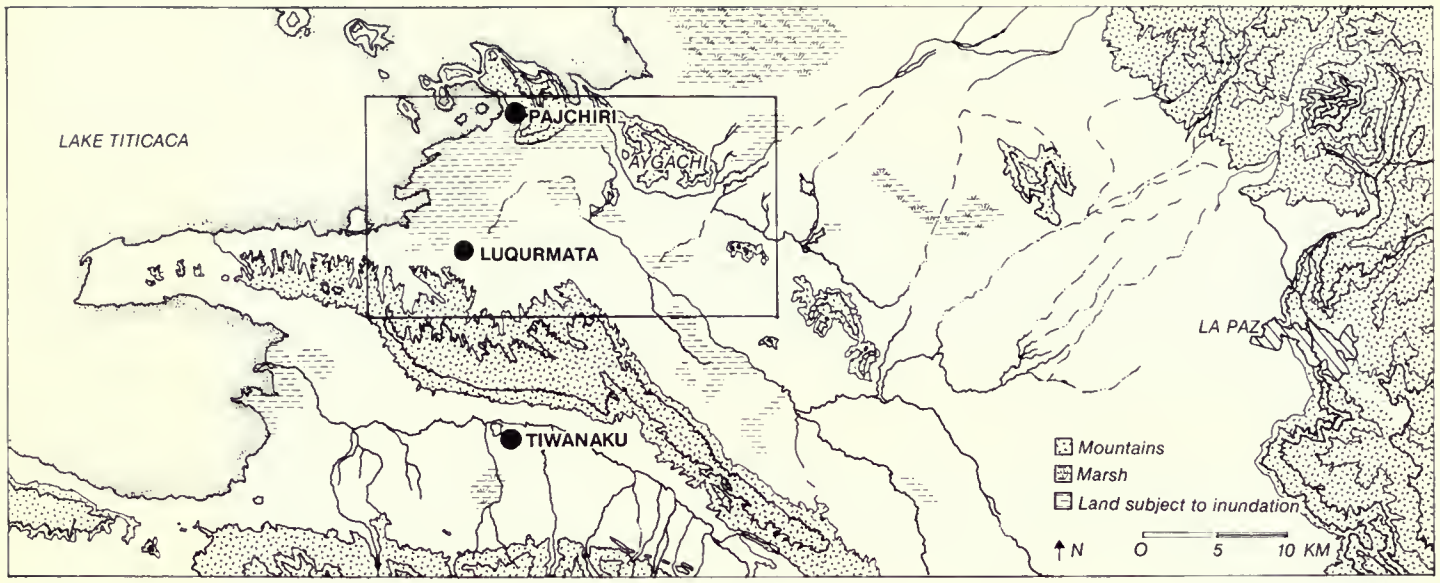
terious" and little known culture, countless theories purporting to explain the genesis, evolution, and impact of Tiwanaku in the ancient Andean world abound. But it is only in the past few years that a reliable body of empirical evidence has emerged capable of testing and correcting the hypotheses embedded in these speculative theories, some of which border on the distinctly bizzare (see "Archaeology at the Top of the World" in *Field Museum of Natural History Bulletin*, October 1979).

THE NATURE OF TIWANAKU

For an entire millennium (100 B.C.-A.D. 900), the political and cultural history of the Titicaca basin was determined by the fortunes of a single people and their singular city: Tiwanaku. Tiwanaku rose to prominence around 100 B.C., first in the southern Lake Titicaca region, and then later, around A.D. 200, throughout the entire lake basin. Monumental construction projects, both architectural and agrarian, began at Tiwanaku during phase 3 (A.D. 100-375) of the Tiwanaku archaeological sequence. They continued unabated throughout the succeeding Tiwanaku 4 (A.D. 375-725), or "Classic Tiwanaku", phase. In this latter phase Tiwanaku achieved true imperial status, establishing administrative centers, satellite cities, and economic colonies over the *altiplano*, in the Bolivian *selva* and on the coasts of southern Peru and northern Chile.

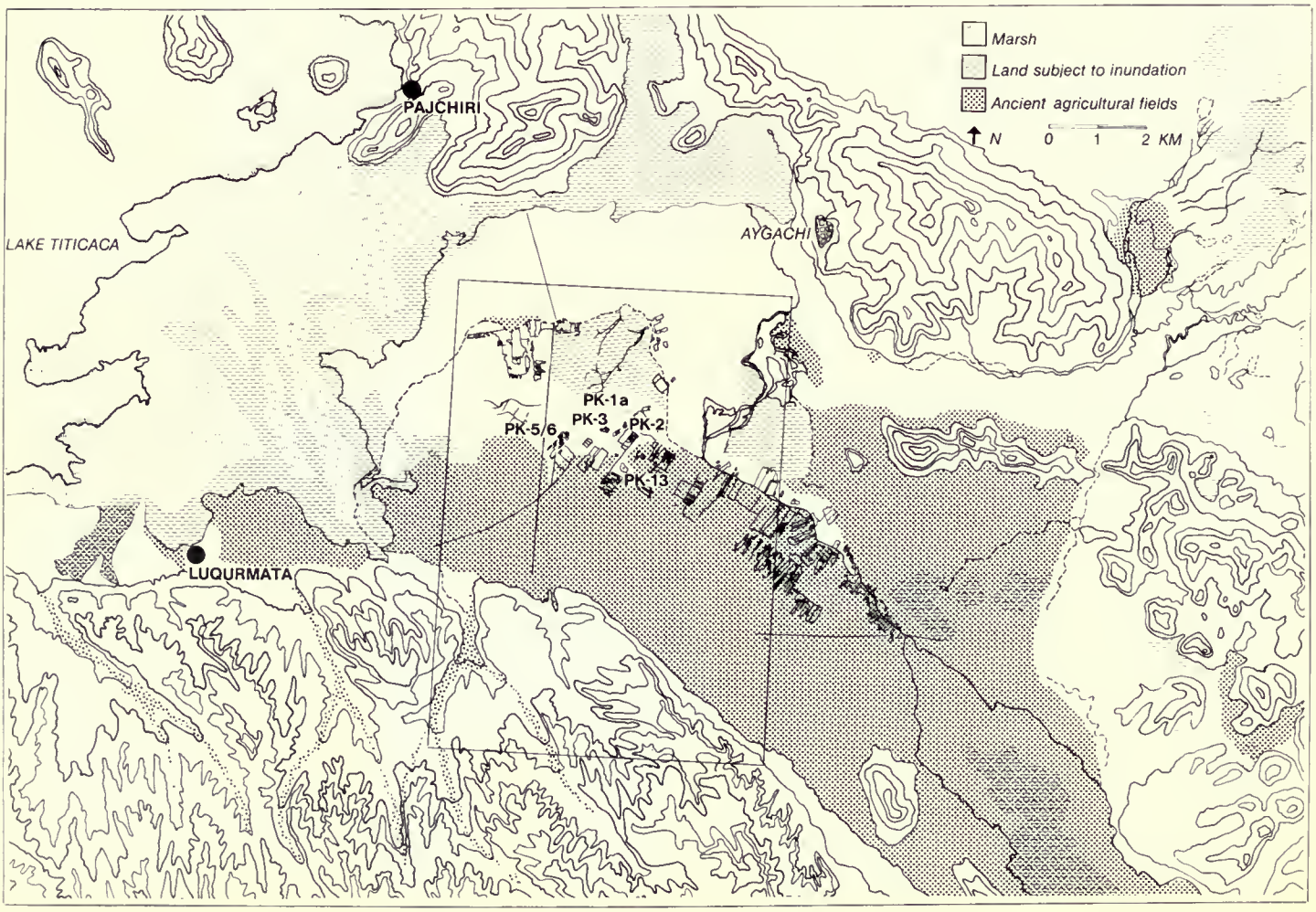
During the sixth century, the inhabitants of the urban settlement of Huari in the southern highlands of Peru adopted and reinterpreted many of the primary symbols and stylistic conventions of Tiwanaku art. From the sixth to the ninth century, Huari was instrumental in spreading its interpretation of the Tiwanaku style, and presumably the religious doctrines and social beliefs enbodied in this style, throughout the highlands and coast of Peru. The precise nature of the relationship between Huari and Tiwanaku remains unclear. It is likely that neither city held hegemony over the other, although the recent discovery of Tiwanaku style building with finely cut ashlar (*i.e.*, hewn, rectangular) masonry beneath the surface architecture at Huari may alter

Cut Spondylus *shell llama figurine, height: 1 in. The* Spondylus *is native to the warm, coastal waters of Ecuador. Its shell was traded throughout the Andes, often as a symbol of royalty. This figurine, now in the National Museum of Archaeology, La Paz, Bolivia, was discovered on the surface of mound* PK-3 *by Anna Kolata in November, 1981. Photo: Fleur Hales.*



Tiwanaku and vicinity. Superimposed box represents area drawn in map below.

Pampa Koani and vicinity. Shown here is an extensive zone of ancient agricultural fields, together with a system of causeways that linked local administrative sites with the regional administrative centers of Luqurmata and Pajchiri. Superimposed box represents the detailed area of fields, causeways, and archaeological sites mapped on opposite page.



Detailed map of a portion of the Pampa Koani showing distinct systems of ancient drained fields, causeways, and the major archaeological sites discussed in the text. White arrows outline the course of an old river meander. Black arrows outline the artificially channelized course of the Rio Catari.

Chullpa, *or stone burial tower, on the island of Cumana overlooking Lake Titicaca. Such towers, along with the agricultural terraces in the background, date to post-Tiwanaku times, in the period A.D. 1000-1500. Photo: Michael Moseley.*

this assessment. Huari and Tiwanaku may have functioned as autonomous, "dual capitals" of the imperial realm, controlling the northern and southern regions of the empire respectively. This type of political arrangement is not without precedent in the history of Andean empire. Just prior to its conquest by the Spanish, the Inca, because of internal political squabbles, briefly had two de facto capitals, one in Quito, the other in Cuzco.

Many archaeologists, particularly those who believe that Huari was the only true political capital of empire in the Andes at this time, have interpreted Tiwanaku simply as a ceremonial center: the focus of periodic pilgrimages from throughout the southern Andes, but lacking a substantial resident population. This interpretation of Tiwanaku resulted from considering only its most impressive monumental architecture: the pyramid of Akapana, and the two major temples of Pumapunku and Kalasasaya (for a description of the principal architecture at Tiwanaku, see "Archaeology at the Top of the World," cited above). However, recent research has shown that the total occupation area of the settlement, including both public *and* residential architecture, exceeds four square kilometers, implying a larger permanent population than had been suspected. Although insufficiently explored, as a first approximation, the density and extent of cultural debris in this residential zone suggests a peak urban population for Tiwanaku between 30,000 and 50,000. There was certainly a much larger nonresident population living in Tiwanaku's surrounding rural hinterland engaged in agricultural and pastoral pursuits to support themselves and the growing urban complex.

PAMPA KOANI: TIWANAKU'S AGRICULTURAL ESTATE

The rulers of Tiwanaku were actively concerned with reclaiming land for agriculture in this hinterland. Around the southern and western shores of Lake Titicaca lies a vast network of prehistoric agricultural fields associated with Tiwanaku 3 and 4 phase sites. These fields are not uniform in size or shape, although all performed a similar function: draining planting surfaces to permit cultivation.

Two major types of field systems can be recognized in the Titicaca basin: (1) extensive raised fields forming low, rectangular platforms which

Continued on p. 23

Portion of a wall built with finely cut stone blocks at the pyramid of Akapana at Tiwanaku.

FIFTH ANNUAL FESTIVAL OF ANTHROPOLOGY ON FILM

FIELD MUSEUM OF NATURAL HISTORY

West Entrance

Saturday and Sunday, September 25, 26, 1982
10:30 a.m.-5:30 p.m.

A SPECIAL INVITATION TO EXPLORE THE RICH DIVERSITY OF WORLD CULTURE ON FILM

Our fifth annual festival features new releases by leading ethnographic filmmakers, a wide variety of work by Chicago area filmmakers, rarely seen expedition footage from Field Museum's film archives, films on ritual and celebration, films of the Arctic and Northwest Coast, and favorite films of previous festivals.

More than 50 films are to be shown in Simpson Theatre, Lecture Hall I, and Lecture Hall II—all within a few steps of the Museum's barrier-free west entrance. Saturday's features include new releases (Simpson Theatre, all day), ritual and celebration films (Lecture Hall I, 10:30 a.m.-2:00 p.m.), films by Chicago filmmakers (Lecture Hall I, 2:00-5:30 p.m.), many highlights from past festivals (Lecture Hall II, 10:30 a.m.-2:00 p.m.) and films from the Arctic and Northwest Coast (Lecture Hall II, 2:00-5:00 p.m.).

Sunday's features include more new releases (Simpson Theatre, 10:30 a.m.-5:30 p.m.), several highlights from past festivals (Lecture Hall I, 10:30 a.m.-1:30 p.m.), and extensive footage from films made during Museum expeditions of the 1920s. Below is a detailed schedule with program notes; final adjustments may be made, however, so be sure to check future listings.

Please use the coupon on page 22 to order tickets. A schedule reflecting any final program adjustments will accompany tickets ordered by mail. However, **this program is to be used as your Festival guide and film notes.** (It may be easily separated from the magazine staples.)

Saturday, Sept. 25

James Simpson Theatre
10:30 a.m.-5:30 p.m.

NEW RELEASES

Sea Side Woman (1979)
by Oscar Grillo
5 minutes; color

An enchanting animation set in the Caribbean. Five minutes of fun and adventure seen through an island girl's eyes. Music by Linda McCartney and Wings.

Goodbye Old Man (1980)
By Australian Institute of Aboriginal Studies
70 minutes; color

An ethnographic record of a bereavement ceremony as practiced by Melville Island's Tiwi people. Shown are activities prior to the ceremonials: painting cemetery poles, dances, a mock attack on spirits of the dead.

The Veiled Revolution (1980)
by Elizabeth Fernea and Marilyn Gaunt
30 minutes

Egypt was the first Arab country where women marched in political demonstrations, removed the veil, and received public secular education. The granddaughters of those early feminists are now returning to traditional values. Why? What do the women say about it?

An Acquired Taste (1981)
by Ralph Arlyck
25 minutes; color

A film about how we experience the notion of success—that obsession with "making it" built so deep into our culture.

This schedule is subject to change

A filmmaker's personal, whimsical journey through his own school and working life in an effort to understand this.

Dadi's Family (1980)
by Michael Camerini and Rina Gill
58 minutes; color

A portrait of village women in India, and of a family in crisis. The women of Dadi's family shatter Third World women stereotypes as they reflect on their lives, roles, and perceptions of change.

Greenaway (1982)
by Sue Gilbert
50 minutes; color

A portrait of an aristocratic American couple living on their own island. Exploring wealth and its manifestations from an "inside" perspective: the filmmaker is their daughter. A Chicago premiere.

Todos Santos Cuchumatan/Report from a Guatemalan Village (1982)
by Olivia Carrescia
40 minutes; color

This film looks at a Guatemalan Indian village. Interviews with villagers reveal political and economic changes now underway; the film also depicts the cycle of the harvest, the fiesta of Todos Santos, and the seasonal migration to work in lowland plantations. A Chicago premiere.

Living Treasures of Japan (1981)
by Norris Brock
60 minutes; color

Japan has honored more than 70 of its citizens as "Holders of Important Intangible Cultural Properties." This film profiles a potter, dollmaker, puppeteer, papermaker, koto musician, swordmaker, textile artist, kabuki actor, and bellmaker.

Lecture Hall I

10:30 a.m.-2:00 p.m.
RITUAL AND CELEBRATION

Bali: The Mask of Rangda (1975)
by Marvin Bellin and Elda Hartley
30 minutes; color

Forty years after Margaret Mead and Gregory Bateson filmed a similar ritual, Bellin and Hartley present an overview of a masked dance drama, narrating their own interpretation.

Iyomande: The Ainu Bear Festival (filmed in 1930s, released 1970)
26 minutes; b/w

A narrated document of the annual Japanese Ainu Bear Festival, depicting preparations for a bear cub sacrifice, with feasting, dancing, and singing. A rich document of material culture and ceremonial life.

Gelede: A Yoruba Masquerade (1970)
by Francis Speed and Peggy Harper
24 minutes; color

An impressive, colorful Nigerian mask dance-drama enacted to combat the forces of witches, reinforcing definitions of men's and women's roles. The film documents events leading to the spectacular midnight appearance of the great Efa masks and the next day's festivities.

Wagon Festival at Puri (1959)
From Encyclopaedia Cinematographica Collection
7 minutes; b/w silent

One of the most amazing wagons ever pulled through city streets highlights Orissa's Juggernaut celebration. The wagon, several stories high, is pulled by dozens of people through crowds of thousands gathered for one of India's great festivals.

Festival at Mizumi (1979)
by Tom Haar
28 minutes; color

A document of a centuries-old spring festival in the town of Mizumi, Japan. Featured are the 12 days of preparation and rehearsal, the performance of Dengaku dances and a Noh play.

Navajo Indians (1939)
by Encyclopaedia Britannica films, with Clark Wissler
11 minutes; b/w

The events preceding and during the marriage of Taska and Alnaba are portrayed in authentic scenes of Navajo work, recreation, and ritual of the late 1930s.

Judge Wooton and Coon on a Log (1970)
by Herb E. Smith
10 minutes; b/w

The dog that gets the raccoon off the log and into the river quickest is the contest winner in this July 4 celebration in Kentucky. Wooton's comments on life in the Kentucky hills are interspersed with the canine feats.

2:00 p.m.-5:30 p.m.
CHICAGO FILMMAKERS

A special 3½-hour program features the work of Chicago filmmakers Tom Palazzolo, Jeff Kreines, Dana Hodgdon, and others, some of whom will be on hand for discussion. Check final schedule for complete listing.

Bean's Bachelor Party, Rodger, Practice Wedding, It's Later than You Think
Films by Tom Palazzolo

Mr. Palazzolo has made more than 50 independent films in his career and is well known for his cinema vérité portraits of Chicago Life. Mr. Palazzolo will be present to introduce his films.

Dear Friends (1980)
by Dana Hodgdon
11 minutes; color

A satirical look at suburban life via the "family Christmas letter."

The Plaint of Steve Kreines as Recorded by His Younger Brother Jeff (1974)
by Jeff Kreines
47 minutes; b/w

Observant, compassionate, and humorous cinema vérité account of the effect on middle-class, Jewish parents of their first-born son finding a job, buying a car, and moving into his own apartment. Expertly made by the younger brother, who interacts with his family during the filming.

Ricky and Rocky (1973)
by Tom Palazzolo and Jeff Kreines
18 minutes; color

A backyard surprise bridal shower filmed cinema vérité in suburban Chicago.

Eula (1981)
by Sharon Zurek and Lucinda Guard
5 minutes; color

A wonderful portrait of a snack shop waitress on Michigan Avenue.

Lecture Hall II

10:30 a.m.-2:00 p.m.

HIGHLIGHTS FROM PAST FESTIVALS

The Nuer (1971)
by Hilary Harris and George Briedenbach
60 minutes; color

Life among these East African herders revolves largely around their cattle, supplying their basic material and spiritual needs. Portrayed are a bride price dispute, a ghost marriage, a revivalistic ceremony to combat smallpox, and a young men's initiation.

Under the Men's Tree (1974)
by David and Judith MacDougall
15 minutes; b/w

Jie tribesmen of Uganda gather under the men's tree for chores of fashioning leather thongs and making spears, and at the same time engage in priceless banter, mostly about automobiles and the relative worth of an automobile and a man.

Cinema (1971)
by Sebastian C. Schroeder
3 minutes; color

In Kabul, Afghanistan, is an itinerant motion picture exhibitor with a wonderfully weird street cinema whose light source is the sun and a hand-cranked projector. Admission is 1¢ and performances last about 3 minutes.

The Painted Truck (1971)
by Judith and Stanley Hallet and Sebastian C. Schroeder
28 minutes; color

There are two methods of transportation in Afghanistan—camels and trucks—and trucks are taking over. This truck driver tells what it is like to live and work there and reveals much about his country's society, traditions, and culture.

Hush Hoggies Hush (1979)
by Bill Ferris and Judy Peiser
4 minutes; b/w

For 35 years, Tom Johnson of Betonia, Miss., has trained his pigs to "pray" before they eat their trough. You have to see it to believe it!

Qeros: The Shape of Survival (1978)
by John Cohen
53 minutes; color

A fascinating document of Peruvian Indians at 14,000 feet in the Andes. The grandeur of the landscape and the beauty of the music, weaving, and ceremonies are ever-present as the film examines their pattern of survival.

2:00-5:00 p.m.

FILMS OF THE ARCTIC AND NORTHWEST COAST

How to Build an Igloo (1949)
National Film Board of Canada
10 minutes; b/w

A demonstration of igloo-building in the far north. We see how snow is chosen, how blocks are arranged, how the igloo is ventilated.

Eskimo Artist: Kenojuak (1964)
by John Feeney
19 minutes; color

In this award-winning film we see Eskimo life through the eyes of Kenojuak, whose beautiful drawings tell us so much about her people's close relationship with nature. Today, her art is eagerly collected around the world.

At the Time of Whaling (1974)
by Leonard Kamerling and Sarah Elder
38 minutes; color

An excellent film from the Alaska Native Heritage Series about the Eskimo's traditional and contemporary culture. Produced by the community in local language. English subtitles. Animal slaughter scenes may disturb some viewers.

The Owl Who Married a Goose (1974)
by Caroline Leaf
8 minutes; color

An animated Eskimo legend with the voices and sounds of Eskimos. Like most Eskimo legends this is based on a nature theme—interacting creatures of the wild. It also has the wry humor of many Eskimo stories.

The Loon's Necklace (1949, restored 1981)
11 minutes; color

Restored version. Through the use of authentic Northwest Coast Indian masks, the film tells of Kelora, a blind shaman who seeks the loon's aid in regaining his sight.

Potlatch: A Strict Law Bids Us Dance (1975)
by Dennis Wheeler
53 minutes; color

This exceptional film is the result of a strong collaboration and empathy between filmmaker and subjects, the Kwakiutl Indians of the Northwest Coast. In the 1920s, the Canadian government made a strong effort to repress the now-famous potlatch, which is of great significance in Kwakiutl culture.

Nathan Jackson, Tlingit Artist (1979)
14 minutes; color

Contemporary Tlingit Indian artist Nathan Jackson speaks on traditional Tlingit art as he creates an elaborate wooden house front.

Sunday, Sept. 26

James Simpson Theatre

10:30 a.m.-5:30 p.m.

NEW RELEASES

Suzhou (1981)
by Sue Yung Li
30 minutes; color

From the "Cities in China" series. An intimate exploration of China's longtime aesthetic and cultural center.

A Wife Among Wives (1981)
by David and Judith MacDougall
75 minutes; color

An inquiry into the marriage systems and values of the seminomadic Turkana of Kenya. This film is the third of the "Turkana Conversations" trilogy by acclaimed filmmakers David and Judith MacDougall.

Long Shot (1982)
by Jane Hunziker
55 minutes; color

A beautiful, pastoral portrait of Basque shepherds in Colorado. The film documents their work through the year. These traditional herders are in competition with the "feed lot" technology—and their way of life is quickly disappearing.
A Chicago premiere.

Courts and Councils: Dispute Settlement in India (1981)
Worldview Productions
30 minutes; color

An intriguing look at legal processes in India with scenes of local councils acting on cases and formal court tribunals reflecting the British legacy of "adversarial justice." A Chicago premiere.

Extinction: The Last Tasmanian (1980)
Artists Film Party
60 minutes; color

This amazing documentary tells the tragic story of British colonization of the island and the annihilation of the Tasmanians.

Fiji: The Great Council of Chiefs (1979)
by Robert Strum
29 minutes; color

Traditional and western components of ritual mix at the 1978 meeting of Fiji Island chiefs.

Soldier Girls (1981)
by Nick Broomfield and Joan Churchill
87 minutes; color

A riveting account of young women newly inducted into the U.S. Army. Shot over a period of months, the film shows their painful adjustment to military life. Some adapt, some do not.

Lecture Hall I

10:30 a.m.-1:30 p.m.
HIGHLIGHTS FROM PAST FESTIVALS

Cinema (1971)
by Sebastian C. Schroeder
3 minutes; color

In Kabul, Afghanistan, is an itinerant motion picture exhibitor with a wonderfully weird street cinema whose light source is the sun and a hand-cranked projector.

Trobriand Cricket: An Ingenious Response to Colonialism (1976)
by Jerry Leach and Gary Kildea
53 minutes; color

A wonderfully entertaining film, *Trobriand Cricket* documents transformation of the traditional British game of cricket into the present Trobriand version.

The Stilt Dancers of Long Bow Village (1981)
by Carma Hinton and Richard Gordon
28 minutes; color

A remarkable film documenting the revival of stilt dancing in a rural Chinese village. Banned for nearly 10 years during the Cultural Revolution, stilt dancing is a folk art that combines myth, history, contemporary politics, and daily village life.

Adama, the Fulani Magician (1980)
by Jim Rosellini
22 minutes; color

An entrancing film portrait of a renowned deaf African street performer and practitioner of ancient magic.

2:00-5:00 p.m.
EXPEDITION FILM EXCERPTS FROM MUSEUM ARCHIVES

Features film excerpts from Field Museum's early collecting expeditions. These rarely seen films show important artifacts from our Anthropology collections in their original context, while other films document zoological collecting techniques in the early '20s and '30s.

Jungle Islands: Crane Pacific Expedition of 1928-29
Intended as a pleasure cruise, this voyage was transformed into a scientific expedition which brought back thousands of specimens.

Rawson-MacMillan Subarctic Expedition of 1926
Field Museum's first expedition into the far north which investigated alleged pre-Columbian Norse ruins. Scientists collected mammals, birds, fishes, minerals, and Eskimo artifacts.

Borden—Field Museum Arctic Expedition
A 1927 trip to Alaska and beyond which brought back valuable zoological specimens and anthropological artifacts.

Ancient Egypt
Fascinating footage of the pyramids, the Nile and the people of Egypt filmed in 1923.

Kelly Roosevelt Field Museum Expedition to Asia
Rare footage from curatorial expedition to Asia in 1929.

Thorne—Graves Expedition to Alaska
This expedition was launched to collect large arctic mammals.

This schedule is subject to change **For Festival information call 322-8854**

Fifth Annual Festival of Anthropology on Film
September 25 and 26, 1982

Last Name First Name

Street

City State Zip

Phone: Daytime Evening

☐ Member ☐ Nonmember

Members: one day: $6.00; series: $10.00
Nonmembers: one day: $7.00; series: $12.00
Students with current college I.D. are admitted at Members' prices.

Saturday only ☐ Sunday only ☐ Entire Series ☐

Number of Tickets Requested_____

Member_____ Nonmember_____

Amount enclosed: $_____ (check payable to Field Museum)

Please use west entrance for free admission to Museum. Confirmation will be mailed* upon receipt of check. Please include self-addressed, stamped envelope. Mail to:

Film Festival/Education Department
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

*If coupon and check are received one week or less before the program, reservations will be held in your name at the west door.

Ancient agricultural fields near the shore of Lake Titicaca. Over 1,000 years ago these fields were remarkably fertile, producing abundant harvests of high altitude adapted crops. Today, these fields lie dormant, graphically testifying to the agricultural prowess of Tiwanaku.

TIWANAKU

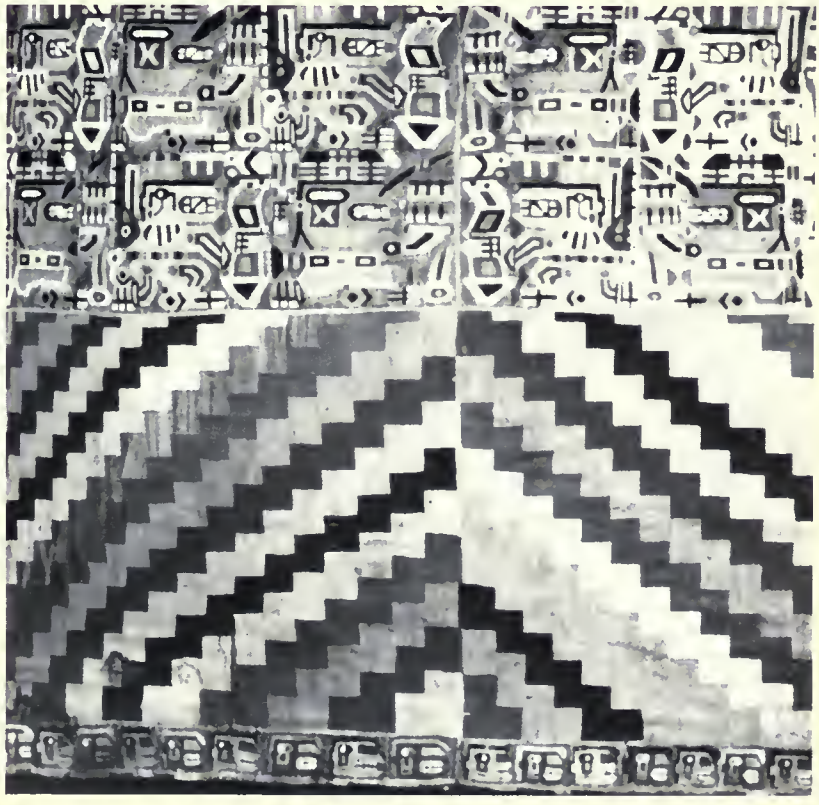
Continued from p. 18

were constructed by excavating earth from either side of the projected field and mounding it in the center. The resulting agricultural construction was an elevated planting surface ranging from 5 to 15 meters wide and up to 200 meters long, (2) linear-ridged fields consisting of narrow (1-3 meters), levelled ridges separated by parallel furrows of similar width. Like its larger counterpart, ridged fields have great variability in length, ranging from 10 to over 100 meters.

There appears to be a correlation between spatial disposition and field type. In general, the larger raised fields are found along the margins of the lake plain, in land which is subject to annual wet season inundation and supersaturation. Most ridged fields, in contrast, are located on land 5 to 30 kilometers from the lake itself, on both level and sloping ground. This apparent spatial separation of field types may have been a function of local differences of drainage requirements, topography, soils, or crop types.

Three years ago, in conjunction with Bolivia's National Institute of Archaeology, I began an ongoing investigation of one important zone of drained fields together with associated sites directly related to Tiwanaku. This zone encompasses an area of approximately 100 square kilometers near the base of the Taraco Peninsula, some ten kilometers north of Tiwanaku. Archaeological survey in this region, called the Pampa Koani, located nine major terraced mounds that are clearly the result of large-scale corporate construction, and a multitude of smaller habitation mounds in direct association with the agricultural fields. Of the nine terraced platform mounds, two contiguous structures, designated PK-5 and PK-6, reached enormous proportions (120 meters × 75 meters × 3.5 meters), rivalling the scale of Pumapunku at Tiwanaku itself.

Subsequent excavation in these platform mounds uncovered a great quantity of ceramics, fragments of copper and bronze, finely polished



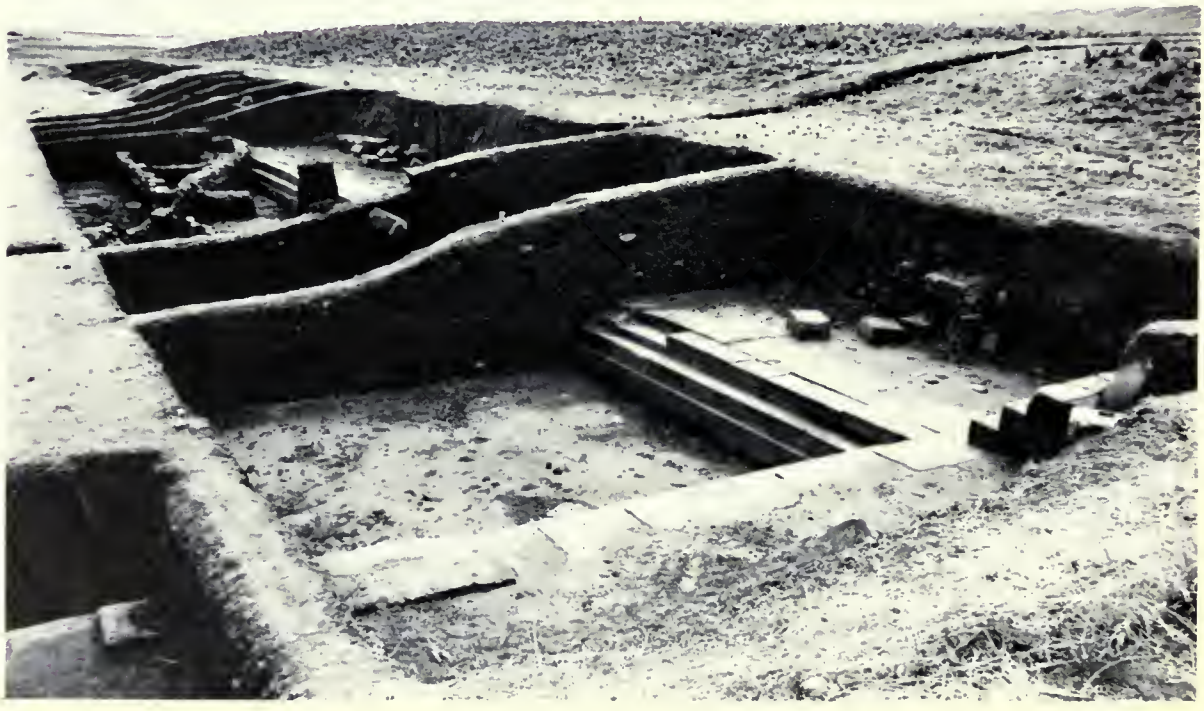
Tapestry tunic from the desert coast of Peru. Portrayed, in the lower register, are representations of trophy heads and stylized geometric designs. In the upper register are complex representations of feline-masked, winged warriors bearing staffs. This textile is a splendid example of provincial Huari-Tiwanaku art.

The author examines modern agricultural fields outside of La Paz. Because of poor drainage, these fields are encrusted with salt. Unless they are properly flushed with fresh water, these fields will rapidly become useless for cultivation. Salinization was also a problem for Tiwanaku's farmers, and may have contributed to the agrarian collapse of the Pampa Koani. Photo: Michael Moseley.

stone and bone tools, and several human and llama burials. Preliminary analysis of the excavated cultural material indicates that the giant twin mounds were initially constructed in Tiwanaku phase 3. During "Classic Tiwanaku" (phase 4) times, the two platforms were remodeled and enlarged. The other seven large corporate structures carry similar Tiwanaku 3-4 dates, although the bulk of the ceramic material pertains to the latter phase.

It is of more than passing interest that in the deepest strata of three excavations, fragments of Chiripa polychrome and fiber-tempered pottery, as well as Tiwanaku 1 phase pottery, were recovered. Evidence of Chiripa, a direct cultural predecessor of Tiwanaku and one of the most ancient ceramic-producing cultures of the Andean area dating to the period from 1500-200 B.C., was found in the deepest layers of our excavations in the structures designated PK-1a/b and PK-3. From the 2.75-meter levels of a test pit in PK-3, we recovered examples of Chiripa Polychrome, among the finest multicolored ceramic wares of this early period in Andean prehistory. Even more significantly, at a depth of 2.80 meters in PK-1a, we discovered a hearth and what may be the curved, cut-stone wall of an ancient Chiripa house.

The significance of this modest architectural discovery cannot be overestimated. Together with the fragments of fiber-tempered and polychrome pottery, this structure is direct evidence



Recent systematic excavations by Bolivia's National Institute of Archaeology at the great temple of Pumapunku at Tiwanaku. Note the beautiful ashlar masonry (regular rectangular blocks of andesite and sandstone) used in the construction of Pumapunku's terraces.

Seeking shelter from a cold altiplano *rain, the author's excavation crew finds refuge, of a sort, under the wooden side of the expedition's truck. Working for the National Institute of Archaeology, these Aymara Indian men have become skilled in the techniques of excavating the ruins of their long-forgotten ancestors.*

that the people of Chiripa were living on the Pampa Koani. As in the later Tiwanaku periods, there was only one compelling reason for the Chiripa people to live on this vast, flat plain on Lake Titicaca's shore: to exploit this incredibly fertile land for agricultural purposes.

Indirectly our archaeological discoveries imply that, from a remarkably early date (1500 B.C.), the people of the Bolivian *altiplano* were engaged productively in agricultural pursuits, perhaps even in the intensive cultivation of ridged fields. If this conclusion is confirmed by future research, the Pampa Koani will take its place as the focus of one of the earliest and most important expressions of aboriginal agriculture in the New World.

Truly massive land reclamation programs, however, were not undertaken until the later Tiwanaku period (phases 3-4). During this time when the major platform mounds were being erected, an entire river, the Rio Catari which crosses the Pampa Koani, was channelized and artificially diverted away from the middle of the pampa to facilitate reclamation of this periodically inundated land. The meander channel of the old river course may be seen in the accompanying field system map, as well as the artificially straightened banks of the "new" course. This field system map is based on aerial photographs which clearly show that the area of drained fields below the old river meander is poorly preserved relative to fossil fields elsewhere on the pampa. Although this must still be properly confirmed on the ground, I would surmise that the poorly preserved fields below the meander represent the oldest systematic network of drained fields on Pampa Koani. At some time after this initial network was in operation, the river was diverted away from the middle of the pampa and artificially channelized to accommodate a vigorous episode of agrarian expansion. All of the better preserved fields to the west and north of the old meander channel probably date to this active phase of new land reclamation. Eventually, drained fields were constructed throughout the entire Pampa Koani region and beyond, to encompass an area exceeding 100 square kilometers.

Architectural and agrarian construction projects of such an audacious scale are the hall-

The two foremen of the excavation crew recording archaeological strata in a deep test pit in mound PK-13 (PWJ-4) *on the Pampa Koani. Visible are various floors of adobe and packed clay representing a protracted occupation of the mound.*

Small Tiwanaku IV phase jar with multiple condor head motif. This jar was excavated from an old occupation floor in mound PK-1a and is now on display at the National Museum of Archaeology in La Paz.

marks of a highly organized, state-level society that can invest in a vast, integrated labor pool. The Tiwanaku state's method of mobilizing labor resources of this magnitude was probably some form of the ancient and virtually pan-Andean labor tax system. The labor tax system, best known from the Inca, who referred to it as the *mita* obligation, required each household to perform a designated amount of labor service for the state each year. The *mita* institution was the driving force behind the rapid and efficient construction of the monumental, government-inspired projects such as palaces, temples, agricultural terraces, and the sweeping, uninterrupted reclaimed fields of the Pampa Koani.

Agricultural activity continued on the Pampa Koani into the succeeding Tiwanaku 5 phase (A.D. 725-1000). Thereafter, there seems to have been massive agrarian collapse, probably brought on by the political disintegration of the Tiwanaku empire. After this time, the drained fields of the Pampa Koani were never reutilized. The Inca occupation of the zone is restricted to the surrounding hillsides which became the focus of a second type of agricultural reclamation: the construction of large terraces, or *andenes*. The abandonment of the Pampa Koani drained fields may have been due to a major change in the level of Lake Titicaca that adversely affected the agricultural regime (modern records show that the lake level fluctuates as much as 4 meters in a decade). Today, this vast zone of agricultural fields lies dormant and salt-encrusted, dwarfing the modern area of cultivation. These fields are eloquent testimony to the agricultural prowess and productivity of the Tiwanaku state.

Head of a sandstone sculpture from the site of Pokotia. This piece is representative of a style of early Tiwanaku stone carving, probably dating to around 300 B.C. It now rests, together with a similar companion piece, next to the portal of the Catholic church in Tiwanaku.

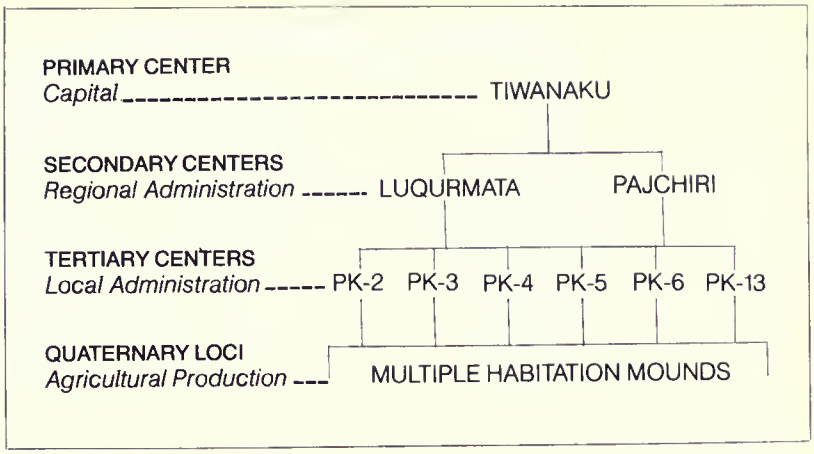
During Classic Tiwanaku (phase 4) times, two major, state-inspired administrative centers were established just west of the Pampa Koani at the edge of Lake Titicaca. One of these centers, Luqurmata, was erected on a large artificially levelled hilltop overlooking the lake. Luqurmata was constructed with dressed stone blocks and features a rectangular sunken court fitted with finely cut staircases and gateways as the principal element of its architectural ensemble. Of course, rectangular sunken courts, polished ashlar masonry, monumental cut-stone gateways and staircases are the most prominent architectural features of Tiwanaku itself, and these served as models for construction in its satellite centers. In addition to the finely conceived architecture at Luqurmata, beautiful, highly burnished Classic Tiwanaku ceramic vessels, semiprecious stone pendants, slivers of embossed gold and silver, and shattered fragments of stone sculpture have all been recovered from this dramatic, acropolis-like site.

Approximately 8 kilometers north and slightly east of Luqurmata, on an opposite shore of Lake Titicaca, lies a virtually identical counterpart nestled into a small bay backed by imposing mountain peaks. This site, called Pajchiri, was

constructed on massive, artificial terraces and also boasts large-scale stone architecture, including a particularly impressive staircase carved from a single block. Although little scientific work has been done on Pajchiri, it clearly dates to Tiwanaku phase 4 times. The proximity of Luqurmata and Pajchiri to the contemporaneous agricultural fields of the Pampa Koani suggests that these remarkable satellite settlements of Tiwanaku were directly involved in administering the huge agrarian reclamation programs on that plain.

Taken as a whole, we can reconstruct a hierarchical settlement network for Tiwanaku and its proximal affiliated sites: Tiwanaku itself as the primary center and capital of the state; Luqurmata and Pajchiri as secondary, regional administrative centers; the major terraced mounds of Pampa Koani as tertiary local administrative centers; and the small habitation mounds dispersed throughout the agricultural fields as quaternary loci of the population engaged in intensive farming. Such a four-part settlement system is a distinguishing characteristic of an integrated preindustrial state and suggests that the Tiwanaku state maintained a high degree of administrative efficiency and centralization of agricultural production.

A similar pattern of strategically located, state-built administrative centers near zones of potentially arable land can be documented for the entire circum-Titicaca region during Tiwanaku phases 3-4. Most of the known Tiwanaku satellite settlements of this type, such as Wankani, Mocachi, and the like, are situated along the southern and eastern rim of the lake in Bolivia. However, there is clear evidence for intrusive Tiwanaku sites in the northern Titicaca basin of Peru near Puno and on the island of Esteves. In addition, Tiwanaku ceramics dating to phases 3 through 5 are documented for a wide area of the Peruvian *altiplano*, particularly in the area around Puno, which, probably not coincidentally, encompasses a wide zone of prehistoric drained fields. This distinctive settlement pattern clearly reflects a political unification of the Titicaca basin imposed by Tiwanaku, directed toward expanding that state's agricultural production.



Schematic Representation of Tiwanaku's Hierarchical Settlement Network

COLONIES AND CARAVANS

The Tiwanaku state economy, although grounded in intensive *altiplano* agriculture, was not restricted to it. With Tiwanaku we have the first unambiguous evidence for a formalized system of vertical control over the economic resources of ecologically distinct zones through colonization. In the Inca empire, state administered economic colonies were termed *mitmaqkuna*. Tiwanaku economic colonies appear to have been fully analogous to the Inca *mitmaqkuna*, which functioned as a critical organizational tool

Two beautiful "Classic Tiwanaku" ceramic portraits of nobles of the realm. The male figure wears a conical headdress, ear spools, and a labret. The female figure, forming the base of a whistling jar, wears an elaborate necklace and has a hole for a removable labret, now missing. These two pieces were said to have been found together in a tomb on the peninsula of Copacabana in Bolivia. They are now in the collection of the British Museum, London.

Tiwanaku IV phase pottery bowl representing llama caravan. Shown here is one of three interlinked llamas with packs on their backs.

of the empire. It is likely that the Tiwanaku (and Huari) economic colonies served as a prototype or model for the later Inca manifestation.

Economic colonies established by Tiwanaku can be recognized to the east of the *altiplano* on the edge of the Bolivian *selva*, as well as to the west, on the Pacific coasts of southern Peru and northern Chile. In the lands to the east of Lake Titicaca, sites such as Sina, Niñokorin and, southward in the Cochabamba area, Arani, Tiquipaya, Pucara and Perereta were founded at various times in the Tiwanaku 3-5 period to exploit the rich resources of this temperate and tropical zone. In this way, the residents of the imperial capital on the highland plateau enjoyed direct access to large quantities of important warm land crops such as maize and coca, as well as more exotic goods such as tropical birds and medicinal plants.

In similar fashion, Tiwanaku maintained colonies on the Pacific coasts in the valleys of extreme southern Peru and northern Chile. Textiles, gold *keros* (a type of drinking vessel) and carved wooden snuff trays in the purest Classic Tiwanaku style have been recovered from graves in Chile. Fragments of Classic Tiwanaku textiles are reported from the Moquegua-Ilo area of southern Peru, as well as somewhat farther north from the Ica area. These objects may very well have been produced at and imported from the imperial capital itself as the possessions of an elite class of Tiwanaku administrators. There are substantial Tiwanaku 5 phase occupations at sites in southern Peru such as Chen Chen, Loreto Viejo, and Tacna, and in northern Chile at Pisagua, Chiu Chiu, Quitor, and others. The archaeological evidence points to intense Tiwanaku interest in and direct utilization of the warm lands of the Pacific coast throughout the Tiwanaku 4 and 5 phases.

Apart from *altiplano* agriculture and *mitmaqkuna*-like colonies, a third element played a vital role in Tiwanaku's imperial economy: llama caravans. It is again in the centuries dominated by Tiwanaku that we have the first solid evidence for the systematic state-directed organization of an important Andean social and economic institution. Llama caravans organized by the Tiwanaku empire journeyed throughout the Bolivian high plateau and into the interior valleys and coasts of Chile bearing enormous quantities of goods to be exchanged and redistributed. Through this Chilean connection, Tiwanaku influence extended even farther to the south into the uplands of northwestern Argentina.

TIWANAKU IN PERSPECTIVE

After the disintegration of the old Tiwanaku empire around A.D. 1000, the political unity in the Titicaca basin that it had fostered was shattered into a number of smaller, competing states. As we have seen, two of the more powerful of these, the Colla and the Lupaqa, were independent kingdoms situated in the northern Titicaca basin. Other similar polities, such as the Collagua to the northwest and the Pacaje to the southwest of Lake Titicaca, maintained their own spheres of influence, although these were continuously contested.

Given the still fragmentary nature of our knowledge about Tiwanaku, it is singularly difficult to assess the impact that this empire of the high plateau had on the ancient Andean world. Nevertheless, we have been able to trace the roots of the integrated, tripartite economy (intensive agriculture, extensive herding, colonies and caravans) that has been historically documented for the late pre-Hispanic kingdoms of Lake Titicaca, to the highly organized state economy engendered and maintained by Tiwanaku over 1,000 years earlier.

We know further that during its thousand-year imperium, Tiwanaku was the paramount city of the Titicaca basin, which, in turn, was the major demographic center of the Andes. Many of the important organizational features characteristic of the later Inca empire can be traced to the shattered remains of Tiwanaku that are left to us. The centralization of political power in an imperial capital, the inculcation of state propaganda through widespread dissemination of an imperial art style, the use of *mita* labor in massive state construction projects, and the establishment of *mitmaqkuna* economic colonies are all archaeologically definable elements in the ancient Tiwanaku polity.

The Inca emperors themselves acknowledged the pervasive influence of Tiwanaku on the political geography of the Andean world when they traced their royal lineage to the inhabitants of that once splendid metropolis of the *altiplano*. In doing this, they were invoking the mystique of Tiwanaku's imperial past to justify their own ultimately successful attempt to reconstitute an empire in the Andes. □

TOURS FOR MEMBERS

Baja California and the Sea of Cortez

February 19 to March 4, 1983

Just 50 miles south of the California border is a subtropical paradise for marine life—the Sea of Cortez. Steeped in legend and history, Baja California and the Sea of Cortez have the mystique of the unknown. Virtually inaccessible by road until 1973 and with only 5 percent of the coastline yet accessible by road, Baja had remained largely unvisited except by the most dedicated of scientists and sportsmen.

What they found, a treasure house of life, you can now share from the comfort of a first-class natural history cruise ship. Lyall Watson, author of *Whales of the World,* has said, "there is probably no other body of water in the world where more species of cetacean can be seen more clearly than in the Sea of Cortez." Add to that a fantastically rich seabird fauna, the richest assemblage of shallow-water marine life in the eastern Pacific, giant barrel cacti, boojum trees, rock paintings, rugged monoliths, and soaring peaks and cliffs plunging vertically into the sea, and you have a natural history trip beyond comparison.

And that's only the first half! The second week of this 14-day tour includes a visit to the outer shore lagoonal breeding and nursery areas of the California gray whale. We will spend two days approaching and watching these wondrous creatures at close range. Also in the second week a visit to the fabulous San Benitos islands, home to huge colonies of elephant seals, sea lions, and diverse bird life.

Pacific Northwest Explorer Sven-Olof Lindblad

Accommodations for the trip will be on board the 143.5-foot Pacific Northwest Explorer, a one-class ship of 99.7 tons gross weight. Built in 1980, air-conditioned throughout, with all cabins outside and with private facilities, this ship is ideal for natural history observation in that her 7½-foot draft allows very close approach to the land and high maneuverability while approaching whales. Veteran Captain Robert Hempstead has captained the ship in two previous and highly successful (1981, 1982) seasons of Baja coastal explorations.

Leading the tour will be Dr. Robert K. Johnson, curator of fishes and chairman of the Department of Zoology. A graduate of Scripps Institution of Oceanography, Dr. Johnson has participated in two previous Baja Circumnavigated tours. Special Expeditions, a division of Lindblad Travel, operators of the ship to be used, will provide several additional naturalists whose expertise will further enrich our experience. For further information and a detailed brochure please call Dorothy Roder, Field Museum Tours, at (312) 322-8862 or write to Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago IL 60605.

Dr. Johnson's article "Baja Circumnavigated" appeared in the October 1981 Field Museum Bulletin.

Viewing sea lions, Sea of Cortez Sven-Olof Lindblad

The grim visage of a jaguar warrior, painted in Mexico a thousand years ago, suggests the military might behind the rise and fall of early states which existed long before the well-known Aztecs and Incas established their empires.

Learning Museum Program Continues With

LATINO IMAGES: THE OTHER AMERICAS

By DONALD MCVICKER, *Sociology/Anthropology Department Head, North Central College, and* ANTHONY PFEIFFER, *Project Coordinator, Department of Education, Field Museum*

For thousands of years neighboring settlements throughout the world were separated from each other by mutual antagonism or passive avoidance and by differing languages and cultural traditions. Social and geographic barriers often narrowed travel and communication to strictly local affairs. However, by 1500 B.C. in what is known today as Latin America, some tribes began to exert their influences over their neighbors. Chiefdoms arose and extended their sway over their neighbor's neighbors. Boundaries of the tribal world were shattered and states were born. As realms that were as mysterious to the conquerors as the far reaches of the solar system are to us were discovered, the first empires emerged.

The preliterate world of the early empires was a world of strangers speaking a babble of tongues. All expansionist states now faced the same problem: how to communicate to a multi-ethnic and multilinguistic populace in the absence of a written language. Imperial art, carved in stone and wood, modeled in clay and adobe, or magnificently painted on walls, became an "international" medium for power proclaiming itself. Subject peoples soon incorporated the symbols of imperial power into their native arts and crafts, only to replace them by other themes as empires collapsed. In ancient highland Mexico, for example, cycles of conquest were recorded on painted walls in public places. The recently discovered murals of Cacaxtla in the state of Tlaxcala depict a bloody battle between jaguar warriors and feathered invaders as well as a new imperial harmony expressed as a balance between the symbols of the jaguar-associated deity Tezcatlipaca and those of the feathered serpent Quetzalcóatl.

Spanish conquistadors brought the pre-

Columbian cycles of conquest to an end; they gained control of the gold and souls they so avidly sought. However, the natives of New Spain learned quickly from their conquerers. They recorded their own versions of events in traditional picture books and in the strange new writing system of the Spaniards. Indian artists adopted Spanish themes as they had adopted the power symbols of their earlier conquerors. Their works of Christian art included remnants of ancient beliefs, skillfully blended with the new symbols. The Cross was molded on traditional clay discs; rows of animal figures recalling the pantheon of native gods were painted in churches, and dogs which evoked the memory of the once all-powerful feathered serpent were carved in convents. Conquest faded, ancient beliefs were supressed; but the tradition of visual art continued to serve as a means of communication with the largely illiterate masses.

The Spanish empire began its long decline during the seventeenth century. Even the seemingly inexhaustable mines of silver and gold began to play out. Although few recognized it at the time, lowly food crops, not royal bullion, were the true treasures of the New World. The early native empires had been based on Indian corn and potatoes, just as centuries later sugar and coffee provided the basis for colonial wealth.

The gradually loosening grip of Spain on her colonies was reflected in both colonial elite art and folk art, with dramatically opposed results. Colonial art, produced by second-rate artists for their patrons, mimicked the Spanish baroque style; folk art, retaining its vitality, reached new heights of creativity. Even today, folk themes dominate much of Latin American art, and appear in both public and private collections.

Spanish American independence was achieved early in the nineteenth century, and modern nations began to emerge. However, it was soon apparent that many independent republics had exchanged one form of colonialism for another; autocratic rule had been traded for repressive dictatorships and Spanish imperialism for Euro-American dependence.

By the end of the nineteenth century the influence of the United States in Spanish America, for good or ill, began to increase spectacularly. This influence resulted in economic progress coupled

The Learning Museum At Field Museum

The Learning Museum Program began at Field Museum in 1979 with a grant from the National Endowment for the Humanities (NEH), a federal agency. The NEH grant allowed the Museum to present a three-year sequence of learning opportunities focused on its outstanding exhibits and collections. Courses were designed to give participants an opportunity to explore a subject in depth. Field Museum is pleased to announce that the Learning Museum Program continues as a featured offering in Courses for Adults *brochures. The program emphasizes special Museum activities and strengths as it did under NEH funding.*

The monolithic "portal of the sun" at Tiwanaku, Bolivia, is portrayed in this engraving. Before the Inca, great highland empires were formed at Tiwanaku and at Huari in Peru. The spread of these empires can be traced by the appearance of the "staff god" (portrayed above the portal) on pottery from Peru's Pacific coast. 2534

with increased inequality. Democratic regimes were supported when they were congruent with American economic and security interests. When they were not, the installations of military dictatorships were condoned. In Mexico, Porfirio Diaz's "bread and stick" dictatorship (1877-1911) opened the floodgates for American and European investments. Investors purchased commercial estates at the expense of peasant land holdings. The scene was set for ten years of revolution.

The twentieth-century Mexican revolution was the first to reverse the tide of dollar imperialism and allow the resurgence of native traditions. Once again the power of art blending ancient and modern themes was realized. Neo-Aztec architecture at the National Autonomous University expressed pride in national heritage, and murals throughout the country sent the message of revolution to the people.

Among the new generation of muralists, Diego Rivera (1886-1957) was the master. In his Mexico City National Palace murals he glorified pre-Hispanic culture, villified the conquerors, and showed the church corrupt. To summarize his vision of history Rivera chose the ancient Aztec symbol of an eagle perched on a cactus. But instead of painting the traditional captive serpent in the eagle's beak, he depicted the symbolic destruction of Spanish rule.

Rivera's message was brought to the United States in the 1930s when he was commissioned to do a mural for the RCA Building in New York's Rocke-

ABOVE: The great 16th-century English botanist John Gerar is portrayed in his work, The Herball or general historie of plantes, *holding a potato plant. Although little esteemed on its arrival in Europe, the Peruvian potato was to prove an invaluable basic food around the world.* 86183A. *BELOW: A Chiriguano Indian woman of Bolivia produces traditional pottery in 1960. Never conquered by the Inca, the Chiriguano fell victim to the Spaniards, and were subject to the Jesuits. When the Jesuits were expelled in 1767 and their lands opened to Spanish civil and military settlers, the Indians fled into the forests. There they retain remnants of their ancient way of life.* 98478

This early Colonial ornamental clay disc, discovered at Teotihuacán, Mexico, is now in the collection of the Field Museum. A Prehispanic sun design serves as the background for a symbolic mountain-temple topped by a Christian cross. 91327

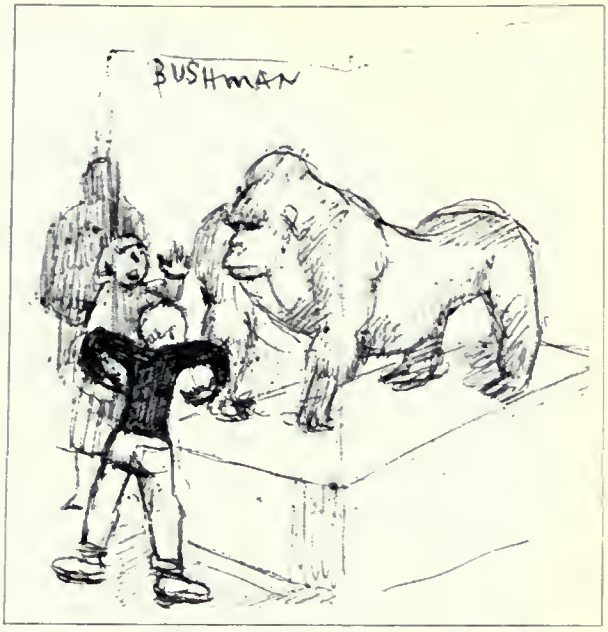
feller Center. The mural set off such a storm of anti-revolutionary protest that the uncompleted fresco was smashed to powder. However, destruction of art by conqueror or capitalist does not suppress the demand for social justice. Even today, revolutionary folk art continues to proclaim its message. On the walls of Chicago's barrios the plight of the Latino minority in the United States is deplored, and the record of United States political, cultural, and economic intervention in Latin America is questioned.□

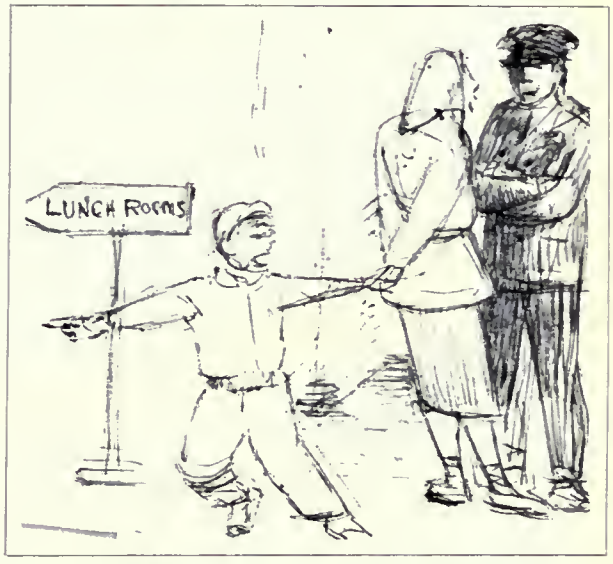
LATINO IMAGES: THE OTHER AMERICAS invites you to explore Latin American culture from pre-Hispanic times to present. Delve into the origins of symbols as visual representations of empire and power. Aztec, Maya, Inca, and other imperial regimes proclaimed their might through emblems which became incorporated into the art of the people they conquered. The Spanish symbols of sacred and secular power were in turn incorporated into the evolution of a new artistic heritage. This heritage kept alive native traditions, which were later reborn in the fire of revolution. Visual symbols of power, which were once expressed in sculpture and mural, are now stated in film. This new medium brings movement and immediacy to the present day Latino struggle for land and liberty.

LATINO IMAGES: THE OTHER AMERICAS offers a look at the roots of Chicago's largest ethnic minority. The program offers timely historical perspectives on Latin America, and the controversial role of the United States in determining its affairs. the program explores how native vitality has endured despite indigenous empire and Spanish imperialism. Discover how the lasting voice of nationalistic art still speaks to the people in an age of global conformity. Listen to the people of Latin America. This is a critical time in the history of the relationship between the United States and the Latin American countries, a critical time for airing issues. How well non-Latinos balance their interests with an understanding of these issues may shape the course of future events from El Salvador to the Falkland (Malvinas) Islands. See the Fall, 1982 *Courses for Adults* brochure for complete program details.

Museum Views...and Viewpoints

These cartoons by Marion Pahl, former Field Museum illustrator, originally appeared in the January, 1957 *Bulletin*. But her candid, tongue-in-cheek sketches of visitor behavior could well have been done in 1982.





We're Here!

William Burger, Chairman of the Department of Botany, recounts an experience while on a recent collecting expedition to Costa Rica: A difficult situation has a happy conclusion, thanks to Costa Rican hospitality

I have often told people what a pleasure it has been to work in Costa Rica. A small democracy between Nicaragua and Panama with a friendly, highly literate populace, Costa Rica also supports an extraordinarily rich flora and fauna. Our work in preparing an encyclopedia-like review of the flowering plants of this region has meant six expeditions for me over the last fifteen years. These trips have covered every month of the year and gotten us into almost every corner of this picturesque and mountainous land.

In all these many trips I have never had an unpleasant interpersonal encounter with a Costa Rican. Whether I've been tramping across a farmer's field, arriving unannounced at a study site, or bumping my Jeep into a police car (with policemen inside), Costa Ricans have always been courteous, open, and friendly. But one always fears that maybe on the next trip the long-overdue bad encounter will take place.

A short time after arriving in Costa Rica in late January, our colleague, Jorge Gomez-Laurito, told us of a dairy farmer on the slopes of Volcan Miravalles who had provided biologists with a room at his home. Jorge suggested we use this as a base from which to collect and I thought it was a great idea. This long-dormant volcano supports lush wet forest and is in a chain of volcanoes in the northwestern part of the country that has been little collected. So, together with Kerry Barringer (visiting assistant curator on the flora project), the three of us piled ourselves and our gear into the Landcruiser and were off for Volcan Miravalles.

Jorge, who has a joint appointment at the Universidad de Costa Rica and the Museo Nacional, had made arrangements. But after traveling five hours and finally working our way up the dirt road to the farm of our intended host—you guessed it—we had arrived before the news that we were coming. Not only had this farmer (a prosperous dairyman) no idea that he might have three visitors he had never seen before, but he was busy loading his family and gear into a station wagon. It seems the entire family was off for a mini-vacation down on the Pacific coast and we had come in just as they were getting ready to leave. Egad, I thought. The last hotel we had passed was nothing more than cinder-block walls with a tin roof and a couple of rooms; this was going to be a very uncomfortable collecting trip. But after introductions and talking with Jorge for a while our host welcomed us to his lovely hacienda, extending us the key of the house, and with the phrase "su casa" left with his family for the coast. I knew Costa Ricans were friendly, but this I hadn't expected.

The ranch-style home on gentle slopes surrounded by pasture and evergreen wet forest formations was our base for three days and nights. After messing up the carport and open porch with dirt and the debris of plant collections you can be assured that we scrubbed and swept it well. This was the least we could do to show our appreciation for such extraordinary hospitality. □

OUR ENVIRONMENT

Killers of Bald Eagle Fined, Sentenced

After pleading guilty to charges of shooting and killing a bald eagle, two Perryville, MO. residents recently were fined $1,000 each, given a one-year suspended jail sentence, and their hunting and fishing privileges suspended for three years. The dead, immature eagle was found near the Mississippi River in Perry County, MO. on February 26.

The Missouri Department of Conservation was notified, and it was soon determined that the bird had been shot with a .22 calibre rifle. It had been banded by the U.S. fish and Wildlife Service as a nestling in northern Wisconsin on June 8, 1980.

A joint investigation was initiated by state and FWS agents. A local news release about the eagle shooting generated a number of leads provided by concerned citizens. After following up on the leads and conducting numerous interviews, agents submitted a report to the U.S. Attorney's office in St. Louis, and that office filed charges in U.S. District Court in St. Louis against the two men for killing the eagle in violation of the Federal Eagle Act, which protects bald and golden eagles. The bald eagle is classified as an endangered species in most states, including Missouri, and either endangered or threatened in every state except Alaska.

New ID Marking on Blackbirds Aids Sunflower Crop Damage Research

Red-winged blackbirds in limited numbers were taken for scientific purposes by state and federal wildlife officials in several northcentral and western states last spring as the birds migrated from wintering locations to breeding grounds. This action was part of continuing efforts by U.S. Fish and Wildlife Service (FWS) research biologists to learn specifics of seasonal movements of the blackbirds as these relate to fall sunflower crop damage in the Dakotas and Minnesota.

Samples of migrating breeding blackbirds taken in Iowa, Kansas, Missouri, Nebraska, North and South Dakota, Wisconsin, and Minnesota and sent promptly to the FWS's Denver Wildlife Research Center (DWRC) were examined under ultraviolet light for identification markings not visible to the naked eye.

Scientists at the research center were looking for birds marked earlier this year by a new method at two wintering roost sites near Squaw Creek National Wildlife Refuge in northwest Missouri. They hope to learn the migration routes taken and locations of breeding marshes used by the marked birds.

The new method used to mark birds for later identification was developed over four years at DWRC. It allows huge numbers of birds to be marked in a relatively short time by helicopter. Masses of roosting birds were sprayed with a harmless fluorescent paint pigment with the substance of talcum powder and visible only under ultraviolet light.

Research Biologist Edward Knittle of DWRC said five to nine million male red-winged blackbirds were marked in northwestern Missouri with the new technique this year. Only about 75,000 blackbirds were marked over the past 15 to 20 years by DWRC scientists using the usual method of applying legbands one at a time by hand to individual birds caught for that purpose.

Knittle believes the new method will lead quickly to greater knowledge of red-winged blackbird populations and their overall distribution in the central U.S., their seasonal movements, and locations of their winter roosting and spring breeding sites. He said this knowledge is an essential step in finding means to effectively control red-winged blackbird damage to sunflower crops.

Two Endangered Fishes Believed Extinct

Two Great Lakes fishes have been proposed for removal from the endangered species list because they are presumed extinct, the U.S. Fish and Wildlife Service has announced. Removal of the two fishes would bring the number of U.S. species listed as "endangered" or "threatened" to 289. The fishes, the blue pike and longjaw cisco, once helped to support substantial commercial fisheries. No specimens of either have been found since the late 1960s.

Blue pike, a subspecies of walleye, historically were found in Lakes Erie and Ontario and in the Niagara River. Similar in appearance to walleye except for their blue color, they weighed 1½ to 2 pounds and grew up to 16 inches long. Blue pike were numerous in the late 1800s, but by 1915 the catch began to show extreme fluctuations between abundance and scarcity; in 1958 the commercial fishery collapsed.

Fishery biologists believe that overfishing led to the population fluctuations and eventual crash of the fishery by disrupting the blue pike's natural balance between production and mortality. Predation by and competition with rainbow smelt, an introduced species, also may have been detrimental to blue pike. The fishery's collapse in 1958 may have been due to oxygen depletion, particularly in western Lake Erie. Hybridization with walleye may have been responsible for the final disappearance of the remaining stock of blue pike.

The longjaw cisco grew to be about 12 to 15 inches long and weighed about a pound, and occurred in Lakes Michigan, Huron, and Erie. Along with other deepwater ciscoes, they were valued as a smoked fish and supported a substantial fishery until about 1950. They were caught by gillnets set in water from 100 to 300 feet deep. As the ciscoes decreased in abundance, net mesh size was decreased, which caused further depletion of the population. Habitat degradation, particularly in Lake Erie, predation by sea lampreys, and competition with smaller ciscoes, alewife, and rainbow smelt are believed to have further reduced cisco numbers. Recent research has indicated that some species of cisco in the Great Lakes may have hybridized and are not presently genetically isolated.

The longjaw cisco was listed as endangered in 1967 and the blue pike in 1970, and a recovery team was established for blue pike. However, since no specimens of either fish could be found, there was little that could be done under the Endangered Species Act to help the species recover. In 1977 the Blue Pike Recovery Team contacted all State fish and game agencies in the United States to determine if blue pike existed in their waters. After all responded negatively, the recovery team concluded that the species was extinct and recommended removing it from the endangered species list. No recovery team was ever established for longjaw cisco. A status review of both species, initiated in 1979, turned up no information to indicate that the two species still exist.

If the fishes are removed from the endangered species list as proposed, federal agencies would no longer be required to consult with the Fish and Wildlife Service to determine if their activities in the Great Lakes region are likely to adversely affect the two species.

The Fish and Wildlife Service is requesting public comments on biological or other relevant data on any blue pike or longjaw cisco populations which may still exist, and any additional information concerning historic range and distribution of these species. Comments should be addressed to Regional Director, U.S. Fish and Wildlife Service, Federal Building, Fort Snelling, Twin Cities, Minnesota 55111.

Public Scores Low in Wildlife Quiz, Study Shows

Most Americans don't know very much about animals or wildlife conservation issues and are more likely to see wild animals on television or in zoos than in the wild, according to a study conducted for the Interior Department's U.S. Fish and Wildlife Service.

The study, which has important implications for wildlife conservation and management programs, was conducted by Dr. Stephen Kellert of Yale University in the fall of 1978 and involved interviews with 3,107 adult Americans. Kellert reported his initial findings in 1979, and has recently published two new reports on his data.

Among Kellert's findings were the following:

- Most Americans know relatively little about animals. Although coyotes are often killed in western states to protect livestock, 75 percent of those surveyed did not know that the coyote is not an endangered species. Half of the public did not know that the statement "spiders have 10 legs," is false, and only slightly more that half knew that insects do not have backbones and that veal does not come from lamb.
- Fifty-eight percent said they cared more about the suffering of individual animals than about species population levels. This is an important finding for wildlife managers, whose work is generally more concerned with conserving populations of animals than with the welfare of each individual member of a species.
- Of all demographic variables, education was the most sensitive indicator affecting knowledge of animals. People with a graduate education knew more about animals than any other group and were more interested in wildlife and more concerned about the natural environment. People with less than a sixth grade education were almost the opposite of those with graduate education in basic perceptions and understanding of animals.
- Differences between urban and rural residents "may represent one of the most difficult and important problems confronting the wildlife management field in the 1980s," according to the study. Residents of rural areas generally know more about animals, participate in more wildlife activities, are more supportive of practical uses of animals, and are less concerned about "animal rights" issues than urban residents. Residents of cities with populations of more than one million had extremely low animal knowledge scores, and were more opposed to hunting and predator control and more concerned about humane or ethical treatment of animals than rural residents.
- Forty-five percent had fished during the preceding two years. The most common reason for fishing was to eat fresh fish (28 percent). Twenty percent fished primarily for sport.
- There are striking regional differences in knowledge and attitudes about animals. Alaskans were the most knowledgeable, followed by residents of the Rocky Mountain states. Residents of the Northeast were the least knowledgeable. Pacific Coast residents were more concerned about ethical treatment of animals and "animal rights" issues and were opposed to hunting more often than residents of other regions. Southerners tended to be more interested than others in practical or material values of animals.
- Watching animal television shows, owning pets, and visiting zoos are American's most frequent animal-related activities. During the two years before they were interviewed, 78 percent had watched a wildlife television show, 67 percent had owned a pet, and 46 percent had visited a zoo.

- Twenty-five percent of the sample had hunted at some time during their lives, and 14 percent had hunted in the two years before they were interviewed. Fifty-three percent of those who had hunted at some time no longer hunt, primarily because of lack of opportunity. Forty-three percent hunted primarily to obtain meat, 37 percent for sport or recreation, and 11 percent to be close to nature.
- Twenty-five percent said they had birdwatched in the preceding two years. Of these, three percent were "committed" birdwatchers who could identify more than 40 species. Contrary to the popular stereotype of the little old lady in tennis shoes, the average committed birder was a 42-year-old male.

Formalin Pronounced Safe for Treatment of Fish Diseases

The U.S. Fish and Wildlife Service has cleared the way for the lawful use of formalin in fish culture after nine years of intensive research that proves the compound can be used without harm to fish, consumers, or the environment.

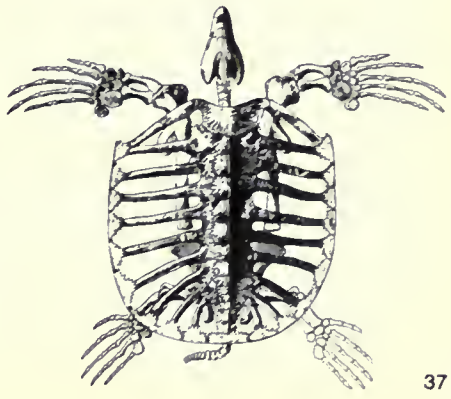
"Fish culturists agree that it's almost impossible to raise important food and sport species such as catfish and trout without formalin to control external parasites and fungal infections," says an agency spokesman. "Thus, our efforts to get this chemical registered have represented one of the service's primary fishery research responsibilities for nearly a decade."

Formalin has been known to fishery experts since 1909, when it was used to control parasites on rainbow trout. In time, the compound became the most widely used chemical in the treatment of fish disease because of its versatility and effectiveness. Use of the drug was lawful until the Federal Food, Drug and Cosmetic Act was amended in 1972, to require registration of all drugs and chemicals used on food animals. After receiving a permit for experimental use, the service undertook the necessary research to register formalin for fishery use. Now, formalin can be lawfully used by federal, state, and private fish culturists to control parasites of trout, catfish, salmon, largemouth bass, and bluegills; and to control fungus on salmon, trout, and pike eggs.

The most common external parasite that plagues fish is *Ichthyophthirius*, or "ich." Formalin can cure "ich," which can infect all freshwater species including home aquarium species—a $60 million industry. All fish are more prone to disease after being handled, as their natural protective coating of slime is gone. Then disease can spread rapidly; for example, *Saprolegnia* fungi can infect and kill virtually all fish or eggs in an enclosure within 24 hours. Both *Saprolegnia* and *Ichtyobodo* ("costia"), which infects fish gills, can be successfully treated with formalin.

Formalin is a liquid formaldehyde solution which is heavily diluted for fish culture use. The standard concentrate is 37 percent formaldehyde, and it is further weakened to a fraction of its original strength before it is used on fish or eggs. The service investigated possible hazards to fishery workers in the course of its research and found no problems when proper precautions were taken.

The service's formalin-related research has been guided by the agency's National Fishery Research Laboratory at La Crosse, Wisconsin. Studies were designed to answer a broad range of questions about the possible drawbacks of its use. Potential side effects on fish that were ruled out included birth defects, cancer, and chromosomal damage that could cause mutants. Other research measured the amount of residue in treated fish, the compound's effects on plants, and chemical interactions with pollutants and other products in the water.



FIELD BRIEFS

Carolyn Blackmon Elected to AAM Committee Chairmanship

Carolyn Blackmon, chairman of the Museum's Department of Education since 1978, was elected to the chairmanship of the Education Committee of the American Association of Museums at its annual meeting in Philadelphia in June.

Mrs. Blackmon came to Field Museum as a volunteer in 1968 and in 1971 became acting coordinator for Harris Extension, which provides exhibits on a loan basis to Chicago-area schools. From 1972 to 1975 she served as coordinator of Special Educational Services for the Department of Education; from 1975 to 1977 she was head of Program Development and in 1977 became head of Public Programs.

New Girl Scout patch

New Girl Scout Patch Program

The Girl Scouts of Chicago, in collaboration with Field Museum's Department of Education, has developed a new patch program for Girl Scouts entitled "Field Museum Exploration." The patch requirements include several planned visits on a group basis to the Museum as well as related troop meeting discussions and activities. To earn the patch the scouts will also develop and exhibit a natural history project.

The Girl Scouts of Chicago was established in 1922, with current membership (ages 5-17) at more than 18,700, comprising 1,200 troops.

Fifth Annual Festival of Anthropology on Film

See pages 19-22 for complete schedule

Carolyn Blackmon

James H. Swartchild 1910-1982

James H. Swartchild, a Field Museum volunteer since 1975, died recently at the age of 71. A skilled photographer, he recorded with his camera a great many Field Museum events, notably Women's Board activities, and photographed thousands of artifacts in the Museum's collections. During each of his seven years at Field Museum he devoted more than 600 hours of service.

Swartchild was a director and past president of the Chicago Jewelers Association. He is survived by his wife, Catherine; two children, Gail and James Jr.; and five grandchildren. His brother, William G. Swartchild, is a Museum trustee and past chairman of the Board of Trustees.

Kellogg Grant Focuses on Field Museum as National Center for Museum Studies

A fellowship/internship program has been launched by the Field Museum to expand the educational role of museums in society. The project is funded by a three-year grant of $405,750 from the W. K. Kellogg Foundation, of Battle Creek, MI. Monies from the grant will support one-week fellowships at the Museum for museum educators, and two series of seminars for museum educators, curators, and designers on the "team" approach to exhibit development. Field Museum staff will serve as faculty during these seminars. Carolyn Blackmon, chairman of the Department of Education, is project director.

The fellowships and internships will cover topics such as goal-setting, policy formulation, museum mission, space resources, exhibit design, and assessing the needs of the local community and the adult learner.

The W. K. Kellogg Foundation, established in 1930 "to help people help themselves," has distributed more than $585 million in support of programs in agriculture, education, and health.

Cole Named Anthropology Head

Glen H. Cole, curator of Old World prehistory, assumed the chairmanship of the Department of Anthropology on July 1, succeeding Phillip H. Lewis, curator of primitive art and Melanesian archaeology, who had chaired or co-chaired the department since December 1975.

Cole received his bachelor's degree from Reed College, his master's and Ph.D from the University of Chicago, and he joined the Field Museum staff in 1965. His research has focused on East African prehistory and he has done field work at a variety of sites in East Africa.

Glen H. Cole

September & October at Field Museum

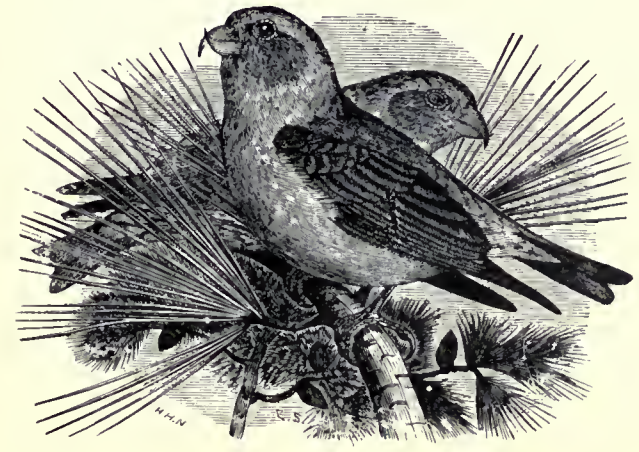
September 16-October 15

Continuing Exhibits

"The People and Art of the Philippines." Through December 31. A stunning exhibit containing some of the finest examples of Philippine art from prehistoric times to the present. The 420 objects have been gathered from 29 private sources and museums, including the Field's fine collection. Special emphasis is given to the prehistoric ceramics and gold, church art from the Spanish colonial period, wood sculpture from the northern tribal peoples and exquisite woven, beaded, and embroidered textiles from southern Philippine peoples. Hall 26, second floor.

"Maritime Peoples of the Arctic and Northwest Coast." Field Museum's landmark permanent exhibit compares and contrasts the way Eskimos and Northwest Coast Indians have adapted to widely differing environments along the continuous northern Pacific and Arctic coastlines. The two groups have flourished since prehistoric times by harvesting the riches of the oceans. The five sections of the exhibit use displays, films, and full-sized replicas to depict the origins, food-gathering techniques, social life, spiritual beliefs, and art of these peoples. Here is an exhibit so big you'll want to return to it often for new insights into how these unique cultures existed in harmony with their surroundings. Hall 10, first floor.

Marine Mammals. Visit these life-sized dioramas to familiarize yourself with the intriguing animals which are the subject of October's *Family Features* and *Discovery Programs*. The pale light of the setting Arctic sun in the walrus diorama suffuses the hall, giving it the watery look of underwater regions where sea mammals might be found. Enjoy scenes of otters or seal parents playing with their young, see underwater views of the horned narwhal and the odd-looking manatee, and marvel at the bulk of a 5,000-pound male elephant seal. Hall N, lower floor.



New Programs

Fifth Annual Festival of Anthropology on Film. This year's program will feature some of the most popular films of the first four festivals, new works by Chicago filmmakers, and rare archival films of early Field Museum expeditions. See pages 19-22 for details. Advance tickets are available from the Education Department, Monday through Friday, 9 a.m. to 4 p.m. or may be purchased at the door. Tickets are: Members, $6; nonmembers, $7 per day. Members, $10; nonmembers $12 per series. Sat. & Sun., Sept. 25 & 26.

Edward E. Ayer Film Lecture Series. Travel around the world via film every Saturday and Sunday in October and November. Narrated by the filmmakers themselves, these free 90-minute film/lectures are recommended for adults. The films begin at 1:30 p.m. in the James Simpson Theatre. Admission is through the West Entrance. Members receive priority seating. Oct. 2: "Austria," Oct. 9: "Hawaii," Oct. 16: "Scotland."

Ray A. Kroc Environmental Field Trips. These one-day field trips with a knowledgeable leader go to local areas of biological or ecological interest. They begin September 11 and are offered weekends through October. See field trip brochure for details. Early registration by mail is strongly advised.

Continued on back cover

September & October at Field Museum

Continued from inside cover

ADULT EDUCATION. Registration is now open for the fall courses which begin October 18. The Learning Museum course will be "Latino Images: The Other Americans." See pages 30-33 as well as the Fall Adult Education brochure for details.

FALL JOURNEY. This self-guided tour of Field Museum's dioramas and other exhibits mirrors what you can see outside in Chicago during the fall season. Free *Journey* pamphlets available at Museum entrances.

"EXTINCTION," a Kroc Environmental Lecture by Dr. Paul Ehrlich. Sunday, October 17 at 2 p.m. Watch for details of this important lecture by one of the world's leading ecologists in next month's *Bulletin.*

being planned around sea mammals. History and legends once depicted them as mermaids or monsters of the deep, but recent scientific research into the social lives and communication systems of whales, dolphins, seals, and otters have shown them to be complex, highly intelligent creatures. Look for a complete schedule in the Education Department's *Calendar of Events* or the *Weekend Sheet* available at Museum entrances.

WEEKEND EVENTS LINE. A prerecorded telephone message gives up-to-date information about such weekend events as Discovery Programs, Family Features, films, and special programs. Call (312) 322-8854 weekends.

5th Annual Festival of Anthropology on Film

OVER 50 FILMS

September 25, 26

see pages 19-22

Continuing Programs

WEEKEND DISCOVERY PROGRAMS AND FAMILY FEATURES. New vistas of natural history will be opened to visitors who attend these tours, films, slide programs, and participatory activities. September's programs will focus on traditions from various cultures. In October a whole range of programs is

MUSEUM HOURS. The Museum is open daily from 9 a.m. to 5 p.m.

THE MUSEUM LIBRARY is open weekdays from 9 a.m. to 4 p.m. Closed Columbus Day, October 11. Obtain a pass at the reception desk, first floor.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

October 1982

Members' Nights

October 7 and 8

6:00—10:00 p.m.

Field Museum of Natural History Bulletin

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Egypt Tour for Members

January 7-26, 1983

$4,200, double occupancy

An unforgettable visit to the land of the pharaohs, including an 11-day Nile cruise aboard a chartered yacht. The tour leader is Del Nord, a distinguished U.S. Egyptologist. For details, write Field Museum Tours, Roosevelt Road and Lake Shore Drive, Chicago, IL 60605, or call Dorothy Roder at the Tours office, 322-8862.

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View of Anderson Lake, Nicolet National Forest, Wisconsin. Photo by Bob Brudd, Tinley Park, Illinois.

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A Special Invitation to Members

The 1983 Field Museum Calendar is now available to Members on a special advance order basis. This year, in addition to receiving your regular copy of the Calendar, you will be able to purchase gift copies of the Calendar issue for friends and family!

The 1983 special Calendar issue spotlights Botany, and includes 12 pages of color illustrations as well as a beautiful color cover. For this limited offer, the purchase price is $3.50 each, which includes the 10% discount to Members, postage and handling costs. There is an additional 10% discount for orders of 25 copies or more.

There is no better way to say Happy Holiday all year long than with this beautiful Calendar from Field Museum. So place your order now—and remember, all gift orders must be received by November 15, 1982.

Order form on reverse side.

PHOTO BY WILLIAM BURGER

1983 FIELD MUSEUM CALENDAR

Please send me _____ copies of the 1983 Calendar at $3.50 each. (This price includes Members discount, postage and handling costs)

Total amount enclosed $_____
Orders must be received by November 15, 1982.
Calendars will be mailed by December 1, 1982.
For further information, please contact the Museum Store at 922-9410.

Please send this form with your check, made out to Field Museum to:

Calendar Gift Offer
Field Museum of Natural History
Roosevelt Rd. at Lake Shore Dr.
Chicago, Il. 60605-2499

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Members' Nights

October 7 and 8

6:00-10:00 p.m.

Have you ever wanted to make your own fossil fish? Or learn about scorpions, centipedes, and spiders? Then be sure to come to Members' Nights on Thursday, October 7, and Friday, October 8, from 6:00 to 10:00 p.m. (Third floor opens at 7:00 p.m.)

Entertainment for Members' Nights will feature the Natyakalalayam School performing dances from India, under the direction of Hema Rajagopalan. These young girls in native costumes perform both pure and expressional dances which are as graceful as they are intricate. Well-received at our Asia festival, they are sure to delight both youngsters and adults.

Another act, featured at our Asia Festival and returning by popular demand, is Han Hua So, the amazing 16-year-old Chinese acrobat. This young woman, who amazed us with her "Bowl Balancing" act, will again perform her dazzling feats in Chinese ballet gymnastics.

Appearing from Chicago's Degerberg Academy will be Nate Defensor and Jim Wauchon, who will demonstrate Philippine martial arts. Sticks, knives, and swords as well as the open hand are used in these arts, which have been described as the most highly developed weapons arts in the world. Passed from generation to generation, they were banned in the Philippines 400 years ago but are today enjoying renewed popularity. The demonstration will keep you spellbound!

Other evening highlights include:

Ground Floor: Serpent Slide Show; Miniature Monsters of the Deep; Make Your Own Family Totem Pole; Animal Camouflage; Collection Showcase on Slides: Malvina Hoffman and Indian Art of the Northwest Coast.

First Floor: Totem Poles, Masks, and Shamans; Pin the Bone on the Dino; In Search of Strange and Unusual Pets; Your Name in the Egyptian ABC's.

Second Floor: Members' Preview of "The Last and First Eskimos" (a photographic exhibit); "The People and Art of the Philippines," our current traveling exhibit.

Third Floor: Architectural Curiosities; Art, Death and Life in New Ireland; Make Your Own Fossil Fish; Scanning Electron Microscope: Vision into the World of the Tiny; Plants of the Bible.

Fourth Floor: Various Aspects of Exhibit and Graphic Design; Silk-Screening Demonstration; Exhibit Production.

Free parking is available in the north Museum lot and the Soldier Field lot. Or use the free round-trip charter bus service between the Loop and the Museum's south entrance. These CTA buses marked *Field Museum* will originate at the Canal Street entrance of Union Station and stop at the Canal Street entrance of Northwestern Station, Washington and State, Washington and Michigan, Adams and Michigan, and Balbo and Michigan. Buses will run circuits beginning at 5:45 p.m. and continue at 15-minute intervals until the museum closes. (Buses will travel to the train stations until the departure of the last train. Please check your train schedule for the exact times.)

Reasonably priced dinners and snacks will be available in the Museum food service area from 6:00 to 8:00 p.m.

To achieve a more even distribution of visitors, we suggest you follow this alphabetical schedule:

A through L: Thursday, October 7
M through Z: Friday, October 8

Admittance will be by invitation, so please retain your Members' Night invitation and present it at the door for admittance for you and your family.

We look forward to seeing you!

Getting There

The journal of former paleontologist Elmer S. Riggs recounts the pleasures, annoyances, and frustrations of expedition logistics sixty years ago

by Larry G. Marshall

". . . lying awake in our bunks among the sagebrush of Wyoming to enjoy the coolness of a desert night," reminisced Elmer Riggs of his field trip days as a student, "looking up into the starry canopy above, we planned an undertaking which each of us was sooner or later to carry out under the constellation of the Southern Cross."

Paleontologist Riggs, who served on the Field Museum staff from 1898 to 1942, saw that dream of collecting in the Southern Hemisphere come true in 1922, when plans for an expedition to southern Argentina (the Marshall Field Paleontological Expedition to Patagonia, 1922-24) were approved. Riggs and two assistants, John B. Abbott and George F. Sternberg, left Chicago on November 6 of that year; but travel sixty years ago was agonizingly slow and more than eight weeks passed before the men were at a collecting site and able to begin scouting for fossils.

The following account, drawn mostly from Riggs' personal journal, covers that frustrating period before Riggs, Abbott, and Sternberg arrived in the field—when the men, impatient to do their collecting, had to abide the endless delays and red tape of foreign travel. But there were good times too: the pleasures of making new friends and the adventure of fresh experience in a strange land.

The Departure
Chicago to New York

November 6, 1922, Chicago. The day of starting on our long-planned journey to South America has arrived. All of the rush and strain of preparation of ceaseless work, days, nights, and Sundays has been leading up to this.

Monday morning, I am up at 6:00 and am off for the Museum at 7:15. Personal clothing is all packed and the men are closing up the trunks of equipment. Abbott is handling the packing, and Sternberg will take over the trunks and attend to checking. At 9:00, Miss Prosser brings the report that Dr. Farrington* is in the Museum. This requires conference in deference to this office, and some delay.

Now comes the report that Martin, the teamster, has fallen dead on the way and Parmelee's Express Company is called to deliver our trunks at the station. Sternberg locks my keys in my suitcase. In locking the photographic chest, my keys are missed and an excited search and exasperating delay follows. Sternberg is sent to the basement to open my suitcase and there the missing keys are found.

A hasty call on the Museum Director, [D.C. Davies], a visit to close accounts with Mr. Bridge, the Museum auditor, to mail some letters, and then lunch in the Museum cafeteria.

A few last good-byes, and at 1:20 a taxi is called for me. $400 is drawn on letter of credit to reimburse my personal account for a check given Mr. Bridge, and I return to the Union Station where I arrive 50 minutes before train time.

Twenty minutes before train time and in comes Mr. Moore of the Museum with a message that the *Southern Cross*, our steamer, has postponed sailing until November 15th. Then Sternberg is sent to see if the baggage is aboard. Nobody wishes to return—but, where is Abbott?

Sternberg and I are starting for the train gate when six minutes before train time in comes Abbott. We take him aboard without explanation and are at last settled in our sleeper for the trip.

We pass out through the familiar suburbs of the city with a feeling that we may not see them for many months again. All have dinner

---

Larry G. Marshall is with the Department of Geosciences of the University of Arizona, Tucson. Later work by Riggs in Argentina and Bolivia was treated by Marshall in the March and May 1978 issues of the Bulletin.

*Oliver Cummings Farrington, curator of the Department of Geology, 1894-1933.

on the Pullman and settle down for a night of rest after a nerve-racking day.

November 7, Pittsburgh. Awoke early to the consciousness that we were at last on our way and that all of the worries were over for a time at least. Then remembering the bundle of money, travelers checks, letter of credit, passport, etc. rolled in my money belt and stowed under the mattress at my head, a new realization of responsibility came to me.

I dressed hurriedly as Sternberg came to say "20 minutes to Pittsburgh." Our baggage was checked while we went to find an eating place. Letters mailed, we all went to Carnegie Museum. Inquiring for Mr. O.A. Peterson [field assistant during earlier Princeton expedition to Patagonia] the door-man asked "Are you gentlemen from Chicago?" To our answer in the affirmative, he advised that we were expected, in a way that was both reassuring and hospitable.

Passing up the stairs to Peterson's study, that genial gentleman came forward with the glad hand and quickly drew up chairs for all. Without more ado he launched immediately into our South American plans. Returning a favor, Peterson prepared letters to ranchmen whom we would meet in Patagonia.

November 8, Washington. Early we awoke, running through the hills between Harrisburg and Baltimore with train an hour late. Upon arriving in Washington, we went at once to the Saint James Hotel where I first put up in '98. Then all went to the National Museum. Mr. Gidley [curator of vertebrate paleontology] soon came in and we were shown about and talked specimens until 1:00 when we went to lunch.

After lunch I went to look up the Argentine Ambassador to get letters to admit our equipment duty-free.

November 9, Washington. In the morning went directly to the United States Geological Survey. ...Secured letters...to corresponding officials of the Argentine Geological Survey. Took train at 3:00, lunch at Philadelphia, and reached Princeton at 8:30. Found lodging at private house....

November 10, Princeton, N.J. ....Found Dr. Farr and learned that Dr. Sinclair had been Curator for some years....Sinclair took us to the

Elmer S. Riggs (1869-1963), was a member of the department of Geology staff from 1898 to 1942. He led twelve expeditions to western United States, two to Canada, and two to Argentina and Bolivia—spending four years in South America. 49132

Museum, opened cases, and furnished books. In the evening after light in the Museum failed, a careful examination of Hatcher's card catalogue* was made and his localities recorded along with lists of specimens found in each.

November 11. The forenoon was spent on finishing the hasty study of collections. The afternoon was devoted to discussion of literature, while Sternberg took an early train to New York.

November 12, New York. Arrived at Pennsylvania Station at 7:10 p.m. and went by subway to Hotel Endicott. Sternberg joined us at 9:00. Sunday morning I went to Hoboken, New Jersey to inquire about the arrival of our goods sent by express, and to have the six trunks from Princeton transferred from Jersey City to Pier 1, Hoboken, the point of sailing. I visited the American Museum of Natural History but found the upper floors closed on account of a flower show. Returned to hotel and spent the afternoon and evening writing.

November 13. All went to Battery park to have passports visaed by Brazilian consul. Then Sternberg went to docks to look after baggage while Abbott and I called on Mr. Stadelman at Marshall Field's and got the tickets. Too much can not be said of Stadelman's courtesy and care for our transportation in and entrance into Argentina, and comfort on the way.

November 14. Sternberg went looking for personal equipment while Abbott and I went to buy army saddles, get new vaccination certificate from Board of Health, and more photographs.

November 15. Date of sailing. Arose only half rested after working until 1:00 a.m. in preparation for sailing. Took taxi for pier at 10:45, picked up army goods on the way. Went aboard at 2:00. Personally supervised loading and distribution of baggage. Sailed at 6:30. Watched lights as we went slowly down the bay, passed Bedloes Island and the Statue of Liberty, then went below to write letters. We were assigned two rooms with bath between; Sternberg and Abbott in room 111, and I alone in room 109. These quarters have been found most comfortable and convenient, thanks to Stadelman.

At Sea
New York to Buenos Aires

November 16. In the night I awoke to feel a gentle rolling sensation and a cold wind blowing through the port. We were passing through a little squall which drowned out the sailor's quarters where ports were left open.

November 17. The first thing is to bring my journal entries down to date. This was planned as a feature of the expedition but in the rush and stress of the past few days has been neglected. Now I am writing for the past ten days with memory still fresh. Another piece of work planned for this voyage is the Log, which Fannie* has asked for as a daily narrative of our voyage. This may be worthwhile for her and the boys. Dinner at 7:00 and I am tired of writing. After dinner a game of cards in smoking room of upper deck.

November 18. Next thing I knew was the bugle blaring out the first call. Then came to me the soldier's complaint, "I'm going to kill that bugler and throw his bugle overboard."

The air is mild and I have donned lighter clothing. The sea is breaking a little and the

**John Bell Hatcher first collected fossils in Patagonia in 1896.*

**Riggs' wife*

Traditional shuffleboard—one of the main diversions aboard the Southern Cross. 48831

Plaza del Mayo in Buenos Aires. Riggs stayed at Avenida Palace Hotel (left). 48947

wind is summery. The seamen are setting up the swimming tank of canvas on a spar frame. I got out my Palm Beach suit and had it pressed.

After lunch, I lie down for a few moments in my state room to rest, the warm air blowing through the ports. This is luxurious and I conclude upon reading a few Spanish lessons. A page or two and the book is dropped. The next I know is the sound of softly swaying music. I slowly awake to the conscious luxury of having slept two hours in mid-afternoon. Not since a child in my mother's cradle have I known such a restful, quiet, rocking to sleep.

While at dinner the steward brought a wireless reading: "On board *Saint Teresa*. Good Luck. Good-bye. Osgood." We answered, "Thanks. All's well. Good-bye. Riggs." [Wilfred H. Osgood, curator of Zoology at Field Museum, was returning from South America.]

November 21. Arose early this morning to have a swim in the tank. After a good breakfast, went to upper deck and punched bag a while. Met Mr. Foulds who is familiar with the Patagonian coast. Told me that Mr. Halliday, to whom I carry a letter from Peterson, is in business at Santa Cruz dealing in Ford cars. He told me also that coastal steamers [between Buenos Aires and Río Gallegos] ran irregularly from four per week to ten or more days apart.

November 22. Met and talked with Reverend Bauman, methodist minister. He advised us to carry rifles south. Second mention of lawlessness in southern provinces in Argentina. Says that everybody carries arms there. Spoke also of difficulty of a foreigner getting title to property. Courts very corrupt. Men 95% anti-religious. Look upon Catholic Church as cause of failure to make progress North America has made. He put it this way—"Puritans came to North America seeking God, Conquistadors came to South America seeking Gold."

November 24. This was the great day on account of crossing the equator. We crossed about 2:00 p.m. Neptune dinner at night.

November 25. Last night some of the passengers asked me to give them a talk on fossil animals. Most of the passengers came and listened in the social hall for an hour. Talked general earth history and finished with fossil animals of South and North America.

November 28, Rio de Janeiro. About noon sighted first land, two mountains 69 miles east of Rio. Toward 3:00 p.m. Sugar-loaf mountain came into view, then the harbor entrance. Delayed in harbor until after sunset. About 8:30 we started ashore.

Walked about until 10:30, very hot, stuffy. Learned just how little we could make ourselves understood in Portuguese.

November 29. At 2:40 we pulled away from the wharf and swung out into the bay. The ocean breeze has driven me below to change Palm Beach suit for woolens and long undergarments. How I shall chafe!

December 2, Montevideo. Awoke to find the steamer entering the Río de La Plata with the city of Montevideo in sight. After breakfast we went ashore. About 1:10 the steamer was backed away by stern tug and once more we were out in the river. The Río de La Plata, celebrated in story and in song, hardly justifies the name "silver river." A little grayer than the sea-water we had become accustomed to, a wake of yellowish mud was constantly stirred by the ship's propellers, and we were told that our ship would often scrape the bottom. The course was marked by buoys.

Buenos Aires

December 3. Awoke to find ship coming to wharf (after 17 days voyage and two days behind

Buenos Aires' Plaza Congreso in 1922. 48950

schedule). After a comfortable breakfast we went ashore, had baggage carried to custom house by porter, examined, stamped, and released. Went to Avenida Palace Hotel. Rooms fairly light with one window in each court. Mr. Hopper took us over and introduced us at American Club.

December 4. Kaiser met us at Custom-house to take trunks through customs. Showed letter from Embassy at Washington, but would not pass trunks duty free. Advised us to see American Consul.

As that office was open only in atternoon, went to inquire about sailing to Río Gallegos. Dropped in on Mr. T.A. Lyman and deliver a letter from Lawrence Armour of Chicago to him. He took much interest, engaged passage for us December 22nd to Río Gallegos, advised about banking, and undertook to clear our baggage.

December 6. Today the *Southern Cross* sails for New York. Had lunch at Y.M.C.A. At 2:00 went to Department of Interior to deliver letter and to ask for credentials to territorial governors.

Called on Mr. Campbell on way home and learned that baggage was cleared of customs, with some incidental expenses of cartage, trouble, *etc.* Kaiser phoned to Museo de La Plata and arranged for our visit there tomorrow.

December 7. Pleasant ride to La Plata, good lunch, nice comfortable walk through park grounds. At 2:00 entered Museum, had great doors swung open to us and the Director ushered us into his office. Had interchange of speeches, of cards, met Dr. Santiago Roth, and Dr. Schiller.

We were greatly impressed with the extent of the paleontological exhibits, the large number of mounted skeletons, and especially the completeness of specimens from the Pampas Formation. The collection of human skulls was all that its reputation led us to expect.

Returned to Buenos Aires at 6:00 p.m. to find our photographs in the evening issue of *El Accieri* with an account of our visit.

While in La Plata, Riggs was notified that a new national law had been passed restricting the collection of paleontological, palaeoanthropological, anthropological, and archaeological specimens by foreign institutions and their personnel. Information concerning this law was broken to Riggs gently by Luis María Torres, director of Museo de La Plata.

The terms of the law were severe and it was drafted by men who were employed to enforce it. Provisions were made for the inspection of all collections by the commission before they could be shipped out of the country; any specimens

Museo de La Plata, La Plata, Argentina. 48961

deemed new to science could be confiscated; half of any series of desirable specimens could be withheld; and the field work could be restricted or certain localities barred. If rigidly enforced, such regulations could greatly limit or vitiate Riggs' proposed collecting efforts.

The law made it necessary for any foreign expedition to place itself under the jurisdiction of the Argentine government. The law provided for establishment of an Argentine commission, consisting of the directors of the principal Argentine museums. The chairman of the commission was Carlos Ameghino, director of the Museo Nacional de Historia Natural in Buenos Aires. Because Ameghino was in poor health, Torres acted in his stead. As fate had it, the Field Museum expedition was the first to come under the new law, but Torres personally assured Riggs that the expedition "would not be embarrassed," that he would freely cooperate with it and secure the necessary permit. In case of any new specimen, he assured Riggs that the deposition of a plaster cast would probably suffice, and also, that where specimens were represented in Argentine museums, nothing would be exacted from the collections made by the expedition.

Collecting permits were sought from two government departments. Although the necessary permission was ultimately obtained, Riggs was required to make monthly reports to the commission. Twenty-three days were spent in Buenos Aires getting through government red tape to secure the necessary documents, and to satisfy Argentine officials that Field Museum's endeavor was honorable.

December 21. Preparations for sailing to Río Gallegos. In the morning there remained the important letters to be written to the Museum. This had been held up awaiting receipt of letters to the territorial governors. Kaiser brought them from La Plata last evening. The forenoon has been spent behind closed doors getting off a letter to the Museum. It was sent in duplicate to Director [Davies] and Curator [Farrington] from lack of time to write two. The important matter concerned permits, restrictions, *etc.* These letters were rushed to mail in time for the sailing of the *American Legion*.

December 22. Sailing from Buenos Aires for Río Gallegos. Had a hurried breakfast and returned to lock trunks and pack hand baggage. Steamer *Asturiano* sails at 3:00 p.m. Went to U.S. Consul and registered, giving a full pedigree, and three photographs.

Early December is summer in the Southern Hemisphere and the sheep shearing season in Patagonia. Absentee estancia owners and their families who normally lived in Buenos Aires visit their outlying properties for vacations and to supervise marketing of the wool. The *Austuriano*'s steerage was crowded with shearers, many from Spain or Italy for the annual shearing season.

After three days sailing, the *Asturiano* arrived at Puerto Madryn, the most northern port in Pagatonia. The straggling town of one-story buildings on a rugged shoreline was an introduction to what Riggs would see farther south.

December 25. Arrival at Puerta Madryn. Awakening shortly before 8:00 the first glance out of the port showed land. A low-lying sandy bar barely two miles away. We entered the narrows of Puerta Madryn. Soon the land closed in on the right and within an hour the scattered buildings of the town could be discerned through the glass. The bluffs beyond, partially bare, appear less than 100 feet above sea-level. They appear a

Elmer Riggs (center) stands by typical high-wheeled Argentine freight cart. 69480

brownish gray in the distance. This we later observe is due to the growth of chica and other scrub. No trees are seen.

About 10:00 a.m. we dock beside a long pier built of black structural steel projecting ½ mile onto the bay [the only steel pier of its kind in Patagonia]. A double track of narrow gauge railroad traverses it. Our Welsh friends went ashore to go by train to Trelew [some 50 km to the southeast]. We all went ashore to find a struggling town of wooden buildings with corrugated iron roofs. A few were painted.

Later Abbott and I walked a mile along a road leading toward the Mesa. We passed on the outskirts a corral and road-house where two South American high wheel carts with wool were standing beside the road. A half barrel which apparently served as a water cask was swung under the iron axle. Other trappings were hung at convenient places. The wool was wrapped in burlap, forming bundles from which scraggly wisps projected everywhere.

Farther along were three wagons, two of the Argentine high-hind wheel type, the third looked American. Under each wagon a man was rolled in a dirty blanket, having a siesta. On the hillside horses wandered seeking food among the chico bushes.

A strange Christmas it was to us in the heat of a sun-baked little port. Tired, I threw myself on my cot and slept until 5:00 p.m. A half hour later the breeze came in from the sea quite cool.

In the evening, at 8:30, we went to dining room. Soon there was evidence of great prepa-

Comodoro Rivadavia, central Patagonia's oil port. 48896

ration, and passengers with townsfolk came in. By 10:00 the room was filled, music began, and soon the waiters were removing tables to make room for dancing.

The Captain led a first number. The tango danced here is very slow and stately with pauses and side movement. A feature of the gathering was the cosmopolitan mixing of all classes. A stout rural policeman in top boots did a patige dance with a fleshy matron, much to the amusement of our English friends.

December 26. Sailing from Puerto Madryn. The event of the morning was the appearance of the enormous German excursion steamer *Cabalonia.* (She was headed through the Straits of Magellan to the Chilean coast and due to return to Buenos Aires by way of the Falkland Islands.) Shortly before sailing I made photographs of town, pier, *Cabalonia,* and finally the harbor with ships as we steamed out at 12:30.

A night run from Puerto Madryn brought the *Asturiano* to Comodoro Rivadavia, the oil-port of central Patagonia. On board were English and American engineers and oil drillers bound for the various camps located there. Comodoro was enjoying a typical boom after oil was discovered there in 1906, and was reported to have a population of 20,000, inclusive of town and some ten neighboring camps.

Comodoro is at the back of a wide bight, with neither harbor nor pier. The ship anchored a mile from shore, and passengers and cargo were towed to shore in lighters. These entered the harbor in early morning, and discharged cargo consisting largely of barrels of north Argentine wine, potatoes and flour from Rosario, and coal from Wales. Mingled with this was the household furniture of families moving from port to port. If the southeasterly winds chanced to be boistrous, as they often were, ships would ride for days at anchor until the weather calmed, or would sail on without discharging cargo. On one occasion during the rough weather, Riggs saw passengers hoisted ashore from lighters in a square of sailcloth by a steam derrick on the landing. The cliffs behind Comodoro are much higher than those at Puerto Madryn, and indicated great possibilities for fossil collecting.

Puerto Deseado, reached on Thursday, December 28, is built on the rugged north bank of the Río Deseado, about two miles from the coast. With a population of 2,000 it enjoyed the distinction of railway terminus for a line running 300 km inland to Las Heras.

December 28, Puerto Deseado. Water is rather shallow for large shipping. Some small islands lie at the river mouth. A larger one known as Penguin Island lies off coast farther south.

The party went ashore in a lighter and spent five or six hours about the town. The buildings are mostly of corrugated iron. The better huts are of cut stone, or of cement finish. Automobiles of Ford, Overland and other makes were everywhere on the streets.

December 29. San Julian. We are anchored since 6:00 a.m. in the river some miles from shore. The land lies low inshore but there are buttes 200 or 300 feet in height to the north. Wool is being taken aboard from large schooner-like lighters.

December 30. Santa Cruz. This port, like San Julian, are typical short-stop visits for north-south bound steamers and were important shipping ports for wool and hides.

Rio Gallegos

At dawn on the last day of the year, December 31, 1922, and the ninth after sailing, the *Asturiano* entered the mouth of the Río Gallegos and set anchor offshore from the port town of Río Gallegos. At 8:30, a lighter towed by a sturdy steam launch came out to greet the *Asturiano.* Passengers lined the rail watching the lighter bobbing upon the waves, bumping ship and ladder. Baggage was lowered aboard and passengers were slowly and fearfully passed down the ladder and swung to the lighter by a pair of swarthy sailors.

A strong westerly wind lashed the harbor waters into breakers and there, tossed about on a choppy sea and drenched with spray, some of the passengers became seasick for the first time. Then the ship's steam launch came alongside and picked up the lighter's hawser and took it in tow, not alongside as had been done in quiet waters but with a long tow line. After 20 minutes of buffeting and liberal sprinkling from salt water, they ran on the beach a mile from the ship. A steep sandy slope strewn with cobble stones and covered with wet sea-mud from the last high tide dipped down to the water's edge. Trunks, bags, sea chests, and bundles of nondescript baggage were born ashore and dumped in heaps by barefooted porters.

A miscellaneous crowd lined the shore. As I approached a stack of trunks, boxes, chests, and furniture, a tall young man asked, "Is this Mr. Riggs?" Receiving my answer in the affirmative he offered a hearty handshake and replied that he was Coleman of Chicago. Then

in quite a genuine manner he asked, "What can I do for you?"

This hearty and friendly greeting did much toward relieving a feeling of strangeness at being dumped ashore amid the babble of a strange tongue. Asking for a hotel and indicating that we had been recommended to the Hotel Argentina, he led us at once to the proprietor who stood near. We took a waiting car to inspect, while the other members of the party collected our baggage. Later we all went to the hotel while a cargador loaded our 16 pieces of baggage upon a two-wheel cart with one horse in harness and a second hitched to the frame.

The city of Río Gallegos, the most southerly port on the Argentine mainland, lies just north of the Straits of Magellan. With a population then of 3,500, it is the capital of Santa Cruz Province. A straggling town of one-story buildings, Río Gallegos extends for a mile or more along the shore. The better buildings were brick faced with cement, but most were constructed of corrugated iron. Only one hotel was two stories in height. In the poorer quarters buildings were constructed of the flattened sheets of metal from kerosene cans nailed to a wooden framework. The streets were in part graded, though seldom paved. Río Gallegos is only slightly more important than neighboring ports to the north, and has not the distinction of a pier, dock, or railway.

Their hotel was built about an open court. There were no outside windows, and the rooms were lighted by means of glass doors leading to the enclosed passageway. No provision existed for heating the room artificially; when the sun shone on the glass-covered areas it was quite comfortable; otherwise one had to put on more clothing or go to bed to keep warm.

The first days in Río Gallegos were highlighted by the cordiality of the English-speaking residents and their eagerness to lend a helping hand. Through the kindness of the Swift Packing Company of Chicago, Riggs had been provided with letters of introduction to G.C. Whitney, superintendent of their plant at Río Gallegos. Whitney lost no time in calling on the party at their hotel and in showing them about the city. He also provided a capable interpreter, Signor Grossi, reputedly the son of an Italian count, who introduced them to the provisional governor, Colonel Isa, and smoothed the way to obtaining those credentials so essential to admitting one to confidence in Argentine communities. The necessary credentials were issued and the party directed to the department of rural police where each man was registered, fingerprinted, and measured. Yet, so well was the matter handled, that they all spent a pleasant half hour at the police station, staying for tea.

Letters of introduction from Governor Isa to a group of English-speaking sheep ranchers in the area made the next step easy. On January 4, Whitney with his car and driver, took Riggs and party to the estancia of Don Carlos Felton, some 20 km from the town of Río Gallegos. In the months to come, Felton's estancia was to prove one of the most productive localities to be worked by Riggs and his party in the province of Santa Cruz.□

Abbott (left) and Sternberg setting up the first camp. 48883

TOURS FOR MEMBERS

Baja California and the Sea of Cortez

February 19 to March 4, 1983

Pacific Northwest Explorer Sven-Olof Lindblad

Just 50 miles south of the California border is a subtropical paradise for marine life—the Sea of Cortez. Steeped in legend and history, Baja California and the Sea of Cortez have the mystique of the unknown. Virtually inaccessible by road until 1973 and with only 5 percent of the coastline yet accessible by road, Baja had remained largely unvisited except by the most dedicated of scientists and sportsmen.

What they found, a treasure house of life, you can now share from the comfort of a first-class natural history cruise ship. Lyall Watson, author of *Whales of the World*, has said, "there is probably no other body of water in the world where more species of cetacean can be seen more clearly than in the Sea of Cortez." Add to that a fantastically rich seabird fauna, the richest assemblage of shallow-water marine life in the eastern Pacific, giant barrel cacti, boojum trees, rock paintings, rugged monoliths, and soaring peaks and cliffs plunging vertically into the sea, and you have a natural history trip beyond comparison.

And that's only the first half! The second week of this 14-day tour includes a visit to the outer shore lagoonal breeding and nursery areas of the California gray whale. We will spend two days approaching and watching them at close range. Also in the second week a visit to San Benitos islands, home to colonies of elephant seals, sea lions, and diverse bird life.

Accommodations for the trip will be on board the 143.5-foot Pacific Northwest Explorer, a one-class ship of 99.7 tons gross weight. Built in 1980, air-conditioned throughout, with all cabins outside and with private facilities, this ship is ideal for natural history observation in that her 7½-foot draft allows very close approach to the land and high maneuverability while approaching whales. Veteran Captain Robert Hempstead has captained the ship in two previous and highly successful (1981, 1982) seasons of Baja coastal explorations.

Leading the tour will be Dr. Robert K. Johnson, curator of fishes and chairman of the Department of Zoology. A graduate of Scripps Institution of Oceanography, Dr. Johnson has participated in two previous Baja Circumnavigated tours. Special Expeditions, a division of Lindblad Travel, operators of the ship to be used, will provide several additional naturalists whose expertise will further enrich our experience.

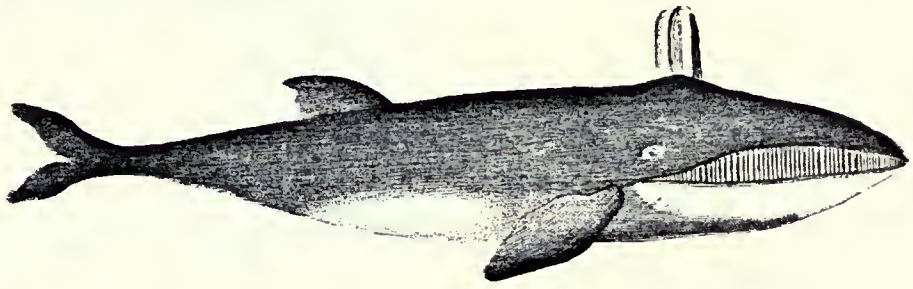
The following prices are from San Diego and include overnight at Holiday Inn Embarcadero. Air fare is not included. Lower deck, double cabin, $2,650, single cabin $3,680; bridge deck: $3,680; main deck: $3,540; upper deck: $2,990 or $3,680, depending on size. We can arrange air transportation to and from San Diego or participants can meet group at Holiday Inn.

For further information and a detailed brochure please call Dorothy Roder, Field Museum Tours, at (312) 322-8862 or write to Field Museum Tours, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605.

Dr. Johnson's article "Baja Circumnavigated" appeared in the October 1981 Field Museum Bulletin.

Viewing sea lions, Sea of Cortez Sven-Olof Lindblad

Cetaceans, Pinnipeds and Sirens of the Sea



Whales and all mammals of the seas have fascinated people throughout history. Drawings of whales dating from 2200 B.C. have been found on rocks in Norway. Aristotle noted in the 4th century B.C. that the marine creatures of the Mediterranean were warm blooded, breathed air, and produced live young. The sacred temple of Delphi was, according to pre-Minoan legend, named for a god that had appeared in the form of a dolphin. The Northwest Coast peoples of North America have for centuries reflected their close association to "skana," the orca whale, in totem poles and silver carvings, and in cleverly executed masks used in dance ceremonies.

Each weekend of this October, Discovery Programs, Family Features, special lectures and performances focus on these intriguing animals. Take a close look at the social lives, habits, and communication systems of these complex sea creatures. Learn about the current status of whaling, and discover the secrets of jojoba—a plant whose oily fruit may help end the slaughter of the sperm whale. Explore the legend and dispel the myths about mermaids, sea sirens and monsters of the deep.

October 2

2 p.m.

The California Gray Whale (16m) film presents biological information on this mammal whose highly predictable habits and migratory patterns nearly led to its extinction.

2:30 p.m.

Saga of the Sea Otter (25m) film. View this unique mammal which possesses the ability to use tools. As a result of an international law established in 1911, approximately 1,200 of these intelligent creatures are protected and survive today in the offshore kelp beds near Monterey, California.

3:00 p.m.

Sea Mammals, slide lecture. Ocean mammals figure prominently in maritime legends. Explore the realms of fantasy and fact about the manatee, dolphin, sea lion, and seal.

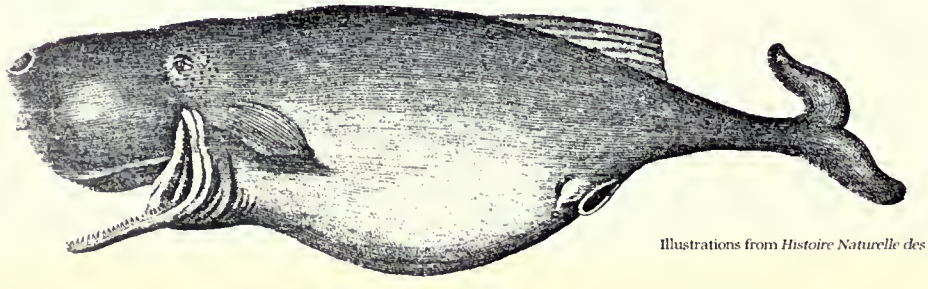
October 9

2:00 p.m.

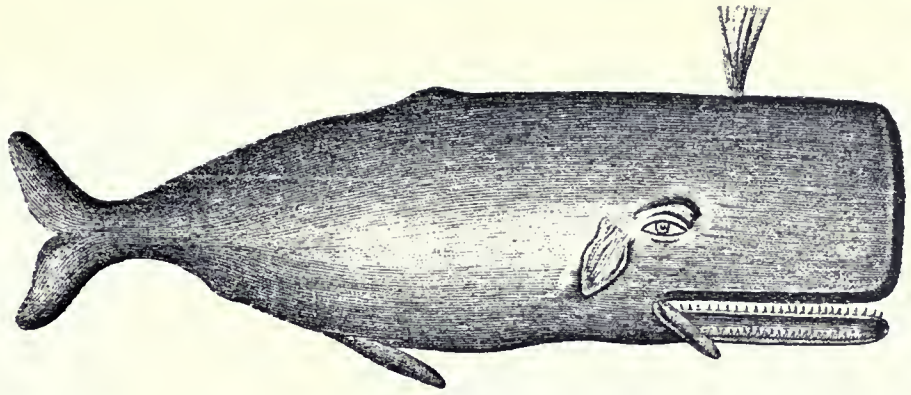
Beluga Baby (25m) film. Watch the drama of the struggle for life of a baby beluga whale born in captivity at the Vancouver Aquarium.

2:30 p.m.

The Right Whale: An Endangered Species (24m) film. A documentary of Roger Payne's research and study of the southern right whale off the coast of Argentina. The film presents findings about the physical characteristics, feeding, mating, raising of young, communication, play, and locomotion of this rare mammal of grace and power.



Illustrations from *Histoire Naturelle des Cétacées* (1804), by C. S. Sonnini



October 16

noon to 2:00 p.m.

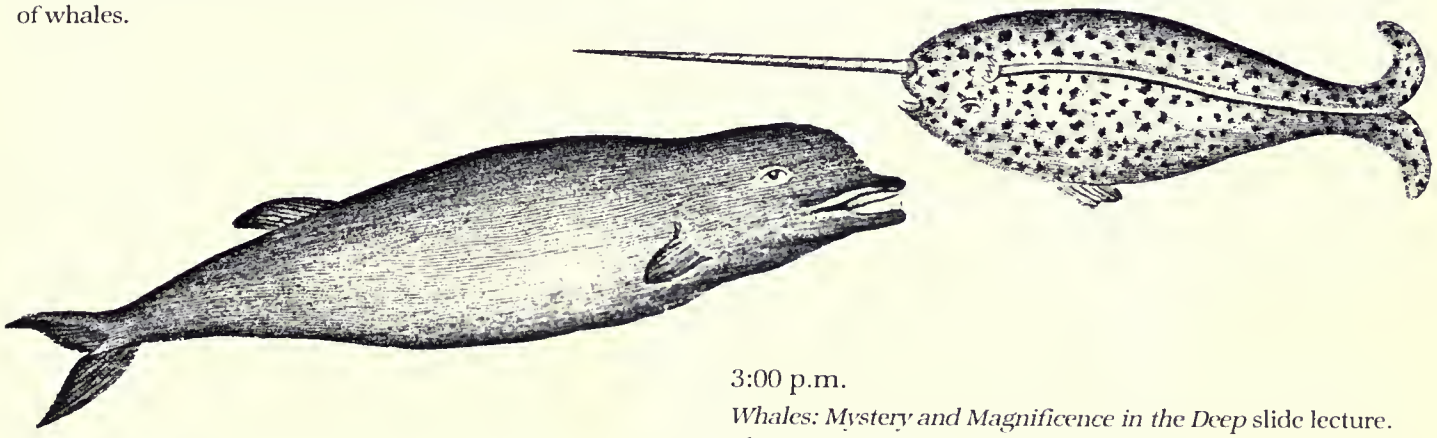
Tagging Whales Family Feature. Net a whale in Field Museum's make-believe ocean. Then compare the whale you've landed with our whale identification chart.

2:00 p.m.

The Orca Whale (28m) film. A study of the endangered "killer" whale which shows this remarkably intelligent creature to be agressive only when provoked. This film studies the orca whale's breathing, communication, and navigation.

3:00 p.m.

Greenpeace—Voyages to Save the Whales film, question-and-answer session follows. Documentary footage of one conservation group's attempt to combat the present-day slaughter of whales.



October 17

noon to 2:00 p.m.

Tagging Whales Family Feature.

2:00 p.m.

Extinction special lecture. Dr. Paul Ehrlich discusses positive proposals for human survival detailed in his most recent book, *Extinction*. He documents the methods of extinction—over-exploitation of a species for meat and fur, poisoning of life support systems, and habitat destruction. Ehrlich makes it clear that each species has a vital role to play in its ecosystem, and all species deserve to exist in their natural balance.
Members: $3.00; nonmembers: $5:00

October 22

8:00 p.m.

The Paul Winter Consort, special performance. Come to Field Museum for an unforgettable evening with the Paul Winter Consort, whose music embraces the sounds of whales, eagles, wolves, rivers, and oceans.
Members: $8.00; nonmembers: $10.00

October 23

2:00 p.m.

Whales, Dolphins and Men (52m) film. Scientists are studying whales to determine their speed, how they use sound to communicate, their ability to see, how to train them, and how they travel through water. This film exposes the brutal and barbaric techniques of modern whaling and presents options to end this senseless slaughter.

3:00 p.m.

Whales: Mystery and Magnificence in the Deep slide lecture. There is something special about cetaceans, something that stirs our emotions, provokes our curiosities, and sparks our imagination. This illustrated lecture provides you with an overview of the world's whales, examines their present status, and asks you to help protect their future.

October 30

2 p.m.

Jojoba (23m) film. Native to harsh, arid, and rocky lands this wonderful plant promises an alternative solution to the unnecessary use of oil from the endangered sperm whale.

2:30 p.m.

The Great Whales (60m) film. At one time these magnificent mammals were feared, hated, and hunted to near extinction. Now the largest creature ever to have lived on earth is emerging as a fascinating source of study for humankind.

Taxidermists Julius Friesser (left) and Frank Wonder complete installation of the giant panda diorama in 1930. 81166

Field Museum's Panda and the Kelley-Roosevelts Expedition of 1929

by David M. Walsten

In December, 1964, *The Giant Panda, A Morphological Study of Evolutionary Mechanisms* was published in the Museum's continuing monograph series, "Fieldiana: Zoology Memoirs." The 339-page treatise was the capstone achievement of D. Dwight Davis (1908-65), curator of vertebrate anatomy who died suddenly just weeks after its publication; the monograph remains today the definitive work on the anatomy of the giant panda, one of the rarest of mammals.[1]

The giant panda specimens studied by Davis included the skeleton of a male acquired in China's Szechuan Province in 1929 by Field Museum's William V. Kelley-Roosevelts Expedition to Eastern Asia. This specimen, which may be seen in a diorama in Hall 17 ("Asian Mammals"), reputedly was the first to be collected by hunters from outside China (and obtained in an age before collecting specimens by means of the rifle was generally frowned upon).

Davis's monograph established the giant panda as a member of the bear family (Ursidae). He found sufficient differences from the rest of the ursids, however—he called the giant panda "a highly specialized bear"—to place it in a subfamily by itself: Ailuropodinae, with

1. Only about eleven giant pandas are now in captivity outside of The People's Republic of China: in the Washington National Zoological Park, the Madrid Zoo, the Zoological Society of London, Mexico's Chapultepec Zoo, and Japan's Ueno Zoo. Madrid's female giant panda gave birth to twins in September of this year.

the rest of the bear family falling into the subfamily Ursinae.[2]

But at the time of the Kelley-Roosevelts Expedition, "no one knew exactly how this animal should be classified, whether it was a bear, a panda or an entirely new species," wrote Theodore Roosevelt in *Trailing the Giant Panda*,[3] the account of the venture he coauthored with his brother Kermit. So for them the search was particularly intriguing. "We had slight hope of getting it," he wrote. "So slight in fact that we did not let even our close friends know what our real objective was."

Plans for the expedition had developed almost casually:

"For some time after we got back from our last expedition...everything was as peaceful as a May morning. It did not seem as if there could be anything more delightful in life than Oyster Bay and our families. There was much to do for both of us, and days passed like scenes in a cinematograph. More than a year drifted by without our noticing it. Then strange but familiar voices began whispering to us....That was the beginning of our downfall....

"Almost without realizing it we started to discuss where we should go next. Naturally we turned to the blank spaces on the map, those fascinating white blotches with perhaps the dotted course of a surmised river marked and "unknown" printed across them. These are much fewer now than they were twenty years ago, but such as they are they beckon just as irresistibly....

"Finally our eyes turned to that part of Asia northwest of Indo-China, where the rugged ramparts of the Himalayas gradually descend to the tropical coastal plains....Kermit and I would strike north into this country either through Tibet or by the old Bhamo-Talifu trail, which runs from Burma to Yunnan. Where we were travelling through uncharted country we would make a rough attempt to map it. After pressing in as far as possible we would collect such of the animals as we could. The Golden Fleece of our trip was the giant panda....

"Once the plans had taken shape the question arose of financing the expedition. Neither Kermit nor I have sufficient money to carry the expense necessary for such a trip. We decided to go to Chicago and tell our old friend Stanley

Theodore Roosevelt, Suydam Cutting, and Kermit Roosevelt (l. to r.), shown in Yunnan. 83433

William V. Kelley, Museum trustee 1929-32 and expedition sponsor. 83432

2. Theodore H. Reed, then director of the National Zoological Park, stated in 1972 (in "What's Black and White and Loved All Over?" *National Geographic*, December, 1972) that "Smithsonian Institution scientists have concluded that the giant panda and the raccoonlike lesser panda merit a separate family altogether. Chinese zoologists hold the same opinion."

3. *Trailing the Giant Panda*, by Theodore Roosevelt and Kermit Roosevelt, Scribners, New York, 1929 (278 pp.)

D. Dwight Davis (1908-65), former curator of vertebrate anatomy and author of definitive treatise on the giant panda. 87164

Field, President of the Field Museum of Natural History....

"The moment we mentioned it to Mr. Field he was enthusiastic. He gave us a dinner that night at his house. There we met William V. Kelley, a generous patron of the Museum.[4] We broached the subject to him and without a moment's hesitation he told us he would stand behind us and finance the venture."

As the region to be visited was known to be bleak and mountainous, with poor roads and not always friendly inhabitants, it was realized that little time could be spent collecting fauna and flora along the road to the interior. So to make a more thorough biological survey, it was decided to take along several trained naturalists, some of whom could remain in one place long enough to gather a representation of the plant and animal life. For this reason the expedition was organized in two divisions, each for the separate regions.

The main division included the Roosevelts, Suydam Cutting, a noted explorer and photographer; and Herbert Stevens, a British naturalist who had much collecting experience in Assam and Indochina. The Roosevelt group sailed from New York on November 10, 1928.

The actual business of the expedition—collecting—was begun at Tengyueh, Yunnan Province, early in January. From Tengyueh, on January 5, the expedition continued northward, while Stevens followed slowly and collected along the way, eventually rejoining the main party. By rather slow and trying stages, with mules and horses for riding and carrying the equipment, over poor roads or mere paths in a mountainous country, the expedition proceeded toward the province of Szechuan, at one point reaching an elevation of 16,000 feet.

The Museum's *Annual Report* for 1929 recounted the expedition's progress:

"As they worked northward, the hunters made frequent inquiries regarding the occurrence of large animals, but until they reached Tatsienlu they were not encouraged to give much time to hunting for the giant panda....although a few specimens from native sources had come out to European museums, they had been in most cases somewhat imperfect and poorly preserved. Reliable information about it was difficult to obtain, and it seemed quite certain that even after its habitat was located it would be very rare and hard to find. A first trial for it was made in a region only two days' travel to the northward from Tatsienlu, but this proved to be based on false reports and the party returned to Tatsienlu. On this short trip, however, several specimens of the burrhel or blue sheep were obtained.

"On March 6, the party left Tatsienlu to proceed eastward to Mouping, where definite information was forthcoming to the effect that at least one giant panda had been seen and killed in that region about ten years before. With this scant encouragement and with the knowledge that the original discovery of the animal had been in this vicinity, six days were devoted to intensive hunting in the hills near Mouping. This was laborious work near the timberline and through heavy bamboo growth in which one can see but a short distance. Old traces of the animal sought were found, but in spite of the best efforts of the Roosevelts and fourteen native hunters who accompanied them, no large game was sighted. In one place, however, they encountered a troupe of the rare and beautiful monkeys known as the golden or snub-nosed monkeys (*Rhinopithecus*) and nine specimens were collected.

"From Mouping the expedition turned southward to the old walled village of Yachow and thence through fairly populous valleys to Tzetati and Tsalo. Near this last place word came that the giant pandas might be found in the country of the Lolo tribe adjoining this Chinese outpost. Hence a special hunt was arranged in the vicinity of a place called Yehli at about latitude 29° 15′ north and a little north of the Chinese village of Tachow. This took place on April 13 and was crowned with success."

In *Trailing the Giant Panda* Kermit Roosevelt described this segment of the expedition:

"We set off with four hunters. A thin misty rain set in. It was a cheerless beginning for what was destined to be our red letter day....further up the valley we turned off into a ravine. It was

4. William V. Kelley was a Field Museum trustee 1929-32.

only a short way further on that we came upon giant panda tracks in the snow. The animal had evidently passed a goodish while before the snow ceased falling, but some sign that one of the Lolos found was recent enough to thoroughly arouse all four natives....

"The beishung [panda] appeared to be travelling along in leisurely fashion, browsing on the bamboos as he went. The amount of sign that he left made us realize that we had been correct in making a conservative estimate of the number of beishung inhabiting the country beyond Muping, in which we hunted....

"The bamboo jungle proved a particularly unpleasant form of obstacle course, where many of the feathery tops were weighed down by snow and frozen fast in the ground. Drenched by rain and soaked by snow, whenever a moment's halt was called we alternately shivered and panted. For a few minutes the sun came out, and we were in dread that it would melt the tracks, but after a brief interval the murky clouds hid it again.

"We had been following the trail for two and a half hours when we came to a more open jungle. Tall spruce trees towered their giant bulk above the bamboos. Lichen-covered alders were dotted about. An occasional blue or yellow flower poked its head up where the snow lay lighter. Here the panda had turned his attention more seriously upon provender. Under one tree he had made himself a nest of bamboos. His claw marks scored the bark, and we looked eagerly among the sturdy branches to see whether we could distinguish a black and white form crouching on a limb. His tracks led...first in one direction, then in another. Unexpectedly close I heard a clicking chirp. It might have been a bamboo snapping or the creaking of the interlocking branches of two trees swayed by the wind. I remembered the eager interest of the Muping hunters at hearing just such a sound. Noiselessly one of them darted forward. He had not got forty yards before he turned back to eagerly motion to us to hurry.

"As I gained his side he pointed to a giant spruce thirty yards away. The bole was hollowed, and from it emerged the head and forequarters of a beishung. He looked sleepily from side to side as he sauntered forth. He seemed very large, and like the animal of a dream, for we had given up whatever small hopes we had ever had of seeing one. And now he appeared much larger than life with his white head with black spectacles, his black collar and white saddle.

"Ted had started in a different direction with another Lolo, so...I eagerly signalled him. Though in reality only a short time, it was a nerve-wracking wait. The giant panda, dazed by sleep, was not really aroused, and was walking slowly away into the bamboos. If frightened it could vanish like smoke in the jungle. As soon as Ted came up we fired simultaneously at the outline of the disappearing panda....

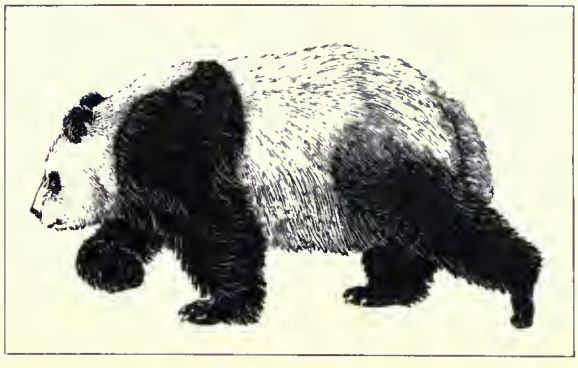
"A couple of the dogs that had been hunting in the valley below now came bounding by us, but they very evidently did not share their master's opinions as to the innocuous character of the beishung. They trailed, howling, behind us and nothing could induce them to go ahead. No help, however, was needed, for the chase ended in seventy-five yards. He was a splendid old male....

"The shikaries [guides], the Lolos, and ourselves held a mutual rejoicing, each in his own tongue. Our great good fortune could only with much effort be credited. We had hunted hard and long, usually in the face of every adverse circumstance.

"Great were the celebrations held that night. The wife of the village headman ordered a sheep to be slaughtered, and resolutely refused to allow us to foot the bill. Intermingled with it all, there was strongly pervading an element of superstition. The beishung was at first not permitted in the compound, and we were afraid that we would have to skin it in the rain and snow and mud. Religious scruples were at length so far relaxed as to permit the shikaries to carry it into an isolated hayloft. A deeply interested group surrounded us at our work, but not an omnivorous Lolo of the lot would touch a morsel of the flesh....after we left a priest was to be sent for and an all-embracing ceremony of purification would be held, to cleanse the house and its surroundings from any shadow that the death of the giant panda might cast upon it.

"The feasting lasted until the small hours.... It was late when we crawled up into the hayloft where our bedding was laid out. Never were the sleeping bags more gratefully welcome. Although we were past the age when "visions of sugar plums" could "dance through our heads," black and white beishungs were never long absent from our dreams that night."

One of the most productive expeditions in the Museum's history, the Kelley-Roosevelts venture acquired a greatly varied collection of the vertebrate fauna of a little-known part of the world. The total number of zoological specimens credited to the expedition was 15,397, of which 1,479 were mammals, 5,194 birds, 453 reptiles, 438 freshwater fishes, and 7,833 insects. In addition there were 2,400 sheets of plants.□



Paul Winter and wolf making music together

The Paul Winter Consort

Friday, Oct. 22
8:00 p.m.

James Simpson Theatre

Spend an unforgettable evening with the Paul Winter Consort, whose music embraces the sounds of whales, eagles, wolves, rivers, and oceans. In the 20 years that Winter has been performing, he has created some of the most intriguing music heard anywhere.

The Paul Winter Consort attempts to enhance our lives by making us aware of the environment and of the plight of endangered species. Winter is a musical "hunter-gatherer," spending his career in quest of "the living sounds of nature and wild beings, to bring life to historic and ethnic traditions of music, and to reawaken the natural resources of harmony and rhythm within people." One of the group's most recent albums, *Callings*, is comprised of recordings that mate human notes with the natural music of land and sea mammals and birds.

We encourage you to order tickets in advance for this very special event. Tickets will be sold at the west door on a space-available-only basis. Call 322-8854 for more information. Members: $8.00, nonmembers: $10.00.

RAY A. KROC ENVIRONMENTAL LECTURE:

"Extinction" with Dr. Paul Ehrlich

Sunday, October 17, 2:00 p.m. James Simpson Theatre

How long can *Homo sapiens* survive if we persist in destroying other species? Ecologist Paul Ehrlich has long warned that destruction of natural habitats is accelerating the rate of species extinction. Have we now reached the point where the future of humankind is threatened? In this illustrated lecture Ehrlich presents positive approaches for survival for our own species and all others.

Paul Ehrlich started his scientific career as an entomologist. As his research widened, Ehrlich became concerned by evidence of habitat destruction which resulted in species extinction. He became alarmed that humankind's exploitation of other species was rapidly diminishing the number and variety of life forms on our planet. *The Population Bomb*, written by Ehrlich in the early 1960s, drew attention to the need for preserving natural resources.

Now Ehrlich's concern has broadened. In his newest book, *Extinction*, coauthored with his wife, Anne, he questions how long even the human species can exist if measures are not taken to preserve the ecological systems supporting our civilizations.

A professor of biology and population studies at Stanford, Ehrlich is a well known expert on ecology and evolution. From his study of the fossil record he realizes that species extinction has always occurred, but estimates that the rate of extinction of bird and animal species has increased between 5 and 50 times in the past four centuries. Ehrlich projects the extinction rate will rise some 40 to 400 times in the coming decades.

Tickets are available at the West Entrance to the Museum one hour prior to the lecture; $3.00 for members, $5.00 for nonmembers.

Paul Ehrlich

EDWARD E. AYER FILM LECTURE SERIES

FALL 1982

These 90-minute travel films are held every Saturday in October and November at 1:30 p.m. in James Simpson Theatre. Admission is free at the Museum's barrier-free West Entrance. Doors open at 12:45 p.m. Members must bring their membership cards for priority seating privileges. When the theatre has reached its full seating capacity, the doors will be closed by Security personnel in compliance with fire regulations. Recommended for adults.

Oct. 2: "The Shadow and Splendor of Austria," with Howard Meyers, Lucia Perrigo

Oct. 9: "Central Africa," with Ron Shanin

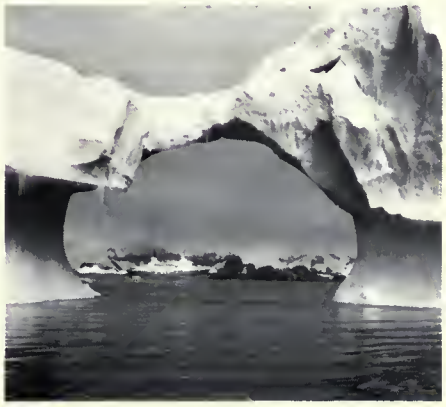
Oct. 16: "Scotland Forever," with Charles Forbes Taylor

Oct. 23: "Yugoslavia and the Slavic Race," with Gene Wiancko

Oct. 30: "The Great Train Trip Across Siberia," with William Stockdale

Nov. 6: "Wandering in Greece," with Bill Madsen

Nov. 13: "Caribbean Paradise," with John Roberts



Nov. 20: "Antarctica," with Ted Walker

Nov. 27: "A Summer in Italy," with Ted Bumiller

The Battle Against Dutch Elm Disease

By DAVID M. WALSTEN

No plant disease has aroused more public distress in the midwestern and northeastern states than Dutch elm disease, which was first recognized on this side of the Atlantic barely half a century ago. For those few manufacturers who have used elm wood in certain products, the loss of these trees has not posed a serious hardship; but it has been of overriding concern to village, town, and city dwellers, for whom the elm (notably the American elm, *Ulmus americanus*) has been an essential part of the landscape.

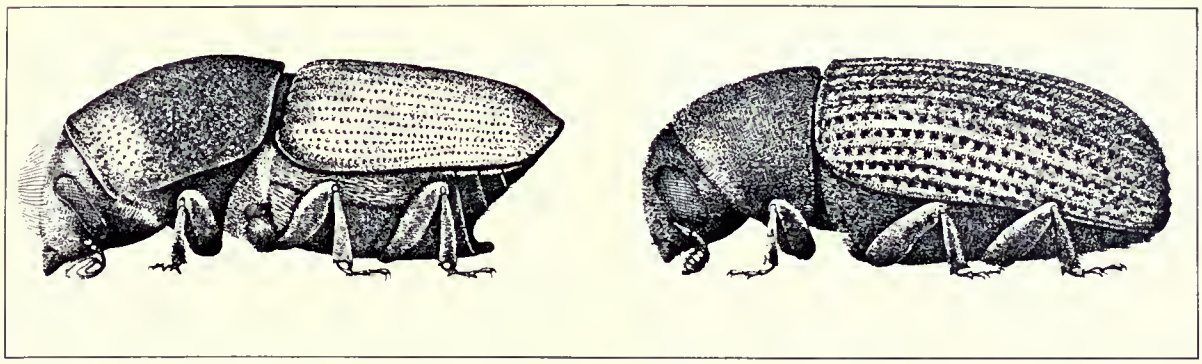
Invariably fatal unless therapeutic measures are taken (even then the prognosis is poor), Dutch elm disease is caused by a single species of microscopic fungus, *Ceratocystis ulmi*, which apparently kills the elm by blocking off fluid-carrying vessels. By itself, the fungus would be of little more than academic interest; but it is partnered by a beetle, which effectively transports the fungus spores on its body hairs from diseased trees to healthy ones. In Europe a number of beetle species of the family Scolytidae (bark beetles) are the disease vectors, or carriers—notably the so-called smaller elm bark beetle, *Scolytus multistriatus*. In North America two species carry the fungus, *S. multistriatus* (known here as the European elm bark beetle) and *Hylurgopinus rufipes*, commonly called the native elm bark beetle.

Most elm species native to North America and Europe (there are about 45 recognized species worldwide) are highly susceptible to the disease. But curiously, about three-fourths of the 20 or so species indigenous to Asia show a marked resistance. This characteristic of many Asian species, it has been suggested, is because in this region where the elm genus is thought to have originated, there has been more time for resistance to develop by means of natural selection.

As the disease has continued its spread in the United States and Canada, the possibility of the elm being wiped out in large areas has seemed less and less fantastic. The prevailing view of experts, however, is that we will win the battle against the disease—eventually.

Several methods have been used, none with much success to date, in combating it: quarantining infected wood, trenching between adjacent

Gillet Avenue, Waukegan, Illinois, before and after Dutch elm disease came to [illegible]. The upper photo was taken in 1962, the lower photo several years later.



The vectors, or carriers, of Dutch elm disease. Left: the smaller elm bark beetle, or European elm bark beetle (Scolytus multistriatus); *right: the native elm bark beetle* (Hylurgopinus rufipes). *The two species are about the same size: 1/12 to 1/8 inch in length.*
From "Dutch Elm Disease," by G. A. Strobel and G. N. Lanier. Copyright © 1981 by Scientific American, Inc. All rights reserved.

elms, *i.e.*, those closer than 50 feet (thus severing the interconnecting roots that can convey the fungus from one tree to the next), the pruning of diseased limbs and the destruction of dead or dying elm wood (in which the fungus can continue to live as a saprophyte and where beetles breed), the application of fungicides and insecticides, the application of bacteria which kill the fungus, the baiting and trapping of beetles, and the development of resistant elm hybrids through selective breeding.

The disease was formally described only as recently as 1919, when it caught the attention of a Dutch botanist—hence, the name. Two years later another Dutch researcher identified *C. ulmi* as the pathogen. In 1934 a U.S. Department of Agriculture worker confirmed the suspicions of earlier investigators that the principal vector of the disease was *S. multistriatus*.

Although the presence of this beetle in North America was first established in 1904 (near Boston), the disease it transmitted was not seen in our elms until 1930, when it was identified in Cleveland. This outbreak was short-lived. Soon after, however, Dutch elm disease began to kill off elms in the New York City area. It had come to stay. By 1950 the disease had arrived in Illinois, by 1952 had crossed the Mississippi (into Missouri), and in 1973 it reached the Pacific coast (Oregon). In 1981 Dutch elm disease remained unreported in only seven of the lower 48 states: Florida, Louisiana, New Mexico, Arizona, Nevada, Utah, and Washington.

The North American Vectors

The native species of elm bark beetle occurs only east of the Rockies, but the European beetle is now found wherever American elms occur. Although it was once believed that the northward advance of *S. multistriatus* was limited by its low tolerance of subzero temperatures in northern latitudes, recent studies indicate that it has quickly adapted to severe cold.[1]

S. multistriatus and *H. rufipes* differ markedly from one another in their habits: The adults burrow tunnels, or galleries, along which they lay their eggs at intervals, the European beetle making its gallery along the grain of the wood, the native beetle tunneling at a right angle to it. Emerging from their eggs, the larvae of both species create individual tunnels as they eat through the wood, working away from the central brood tunnel. At the far end of its individual tunnel, the larva pupates. The adult that finally emerges bores upward to the bark surface, then flies off, traveling as much as several miles. Typically, the American beetle attacks the elm's trunk and lower limbs, while its European counterpart attacks the upper crown. A healthy elm is most apt to be attacked in late May, in June, or early July.

S. multistriatus has two generations per year in more northern latitudes; in the southern part of its range a third generation is begun. The native beetle usually has only one generation per year and completes the winter in the tree as a fully grown larva or as an adult. It flies off in late summer to another tree to feed on limb bark, then crawls to the trunk or a large limb, where it overwinters in the outer bark.

Beginning in spring, adults of the European beetle fly to trees that are already in a state of decline, where they breed. Some females breed for a second time in another tree. Fully grown larvae overwinter in the bark, first emerging as adults about mid-May.

The fungus is spread to a new tree by the European beetle when it penetrates a twig crotch to feed. It is believed that the native beetle transmits the disease in spring when it moves from its hibernation site in the outer bark to feed in the branches or when it moves to the sapwood.

Recognizing an Infection

The first sign of Dutch elm disease is the wilting of leaves, most often at the tips of branches, followed by curling and progressive yellowing and browning; or the leaves may dry up while still green. (These conditions may have other causes as well; diagnosis must be left to an expert.) Investigators at Utah State University and the

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David M. Walsten was formerly in a Dutch elm disease control program at the University of Wisconsin.

Early spring view of a 55-year-old hybrid elm (Ulmus japonica *x* U. wilsoniana) *at Morton Arboretum, Lisle, Illinois. This handsome hybrid is one of a number being tested for resistance to Dutch elm disease by George Ware and associates at the arboretum. Photo by John Kohout, courtesy Morton Arboretum.*

Connecticut Agricultural Experiment Station believe that a toxin produced by the fungus interferes with the mechanics of fluid transmission in the elm's vascular system: the leaves wilt and die simply because they are not getting enough water. In any case, an infected elm will succumb to the disease if left untreated. But the percentage of cures is low and these are confined to trees in early stages of the disease. Diseased limbs must be pruned and the wounds dressed.[2] But pruning is no guarantee of survival, for the fungus may already have spread within the tree's system.

Fungicides

In the mid-1970s, a systematic fungicide (*i.e.*, one that is injected into the tree) with benzimadazole as its active ingredient, was approved by the EPA and marketed for use against Dutch elm disease. Some strains of *C. ulmi*, however, have been shown to be resistant to this fungicide. Arborists also reported that the formulation did not truly kill the fungus, but merely inhibited and isolated it within the tree. Although this formulation continues to be marketed by several manufacturers, some arborists have discontinued its use. It has been shown to be of little or no use in treating trees already infected with the disease, and some report that injections, which must be done annually, are not only costly, but the multiple injection holes can severely weaken the tree and make it vulnerable to secondary infection.

About five years ago another EPA-approved formulation, with thiabendazole as its active ingredient, was also marketed. Resistance in *C. ulmi* has not been observed, but the product is costly, and the multiple, annual injections of this fungicide can also result in secondary infections that may weaken or kill the tree, report some arborists.

A recent wire service story reported that an Iowa arborist had been successful in the treatment of Dutch elm disease by using a preparation of mercuric chloride, long recognized as a powerful fungicidal agent. The story failed to mention, however, that mercuric chloride, highly toxic to man and wildlife, is not approved by the Environmental Protection Agency for such application.

A Fungus-Killing Bacterium

Recent work at Montana State University offers some hope that biological weaponry against the fungus may be effective. Under Gary A. Strobel, the Montana research team found a bacterium, *Pseudomonas syringae*, that produces a substance which inhibits the growth of the fungus. The bacterium and its antimycotic agent are not toxic to elms, and the bacterium introduced into living elm tissue has demonstrated its ability to survive there. Experimentally, Strobel's team showed that fungus-infected elms became infection-free after inoculation with *P. syringae*.

In a field experiment, "...22 diseased trees were treated with the bacteria and an equal number of trees were left untreated as controls. All the control trees but one either died or declined drastically in... two growing seasons. In the treated groups seven of the eight trees that were lightly infected and were treated early in the growing season survived with little or no sign of decline over two... seasons. The other treated trees that either were treated later in the season or were more heavily infected died or declined."[3]

So far, so good. But Strobel points out that several important questions remain to be answered: Can the bacterium thrive and spread in an elm population? Could *P. syringae* prove pathogenic to certain plants? Can it pass human and environmental safety standards? A major chemical firm is field testing the bacterium, with

a view toward possibly marketing it. But even if all goes well, it will be a considerable time before *P. syringae* or its synthesized antimycotic are available on the shelves of lawn and garden supply stores.

Harold Hoover, assistant superintendent of Forestry for the city of Elmhurst, Illinois, has also been doing field tests with *P. syringae*, involving himself particularly with problems of fluid translocation in the elm. Conventionally, fluids containing *P. syringae* (as well as systematic fungicides and insecticides) are administered through 5/16 inch holes drilled into the tree to a depth of about 1½ to 2 inches. By means of dye tracers, however, Hoover found that the movement of fluids radially from the column of tissue receiving the inoculate is not sufficient in elms to properly infuse peripheral tissues infected with *C. ulmi*: in twigs and small branches and just under the bark of the trunk and major limbs.

For better fluid distribution, Hoover introduces his material through a cut made with a circular saw that completely girdles the trunk, penetrating to a depth of about two annual rings and angling downward about 25°. As Hoover continues to experiment and test his radical technique, he is also trying to reduce mortality that is a common sequel to cutting the tree so severely.

Beetle-Inhibiting Fungus

A researcher at the University College of Wales, J. Webber, has found that a fungus, *Phomopsis oblonga*, which occurs naturally in elm bark, particularly in the wych elm (*U. glabra*), indigenous to Britain, could be playing an important part in limiting the disease in some parts of Britain, where it first appeared in 1927.[4] Tests with *S. multistriatus* and *S. scolytus* showed that *P. oblonga* reduces the number of beetle offspring as well as the amount of potential breeding material. Both factors, Webber believes, have some role in reducing vector populations. But, he concludes, how this reduction can influence the spread of Dutch elm disease in Great Britain is still open to speculation.

Baiting and Trapping of Beetles

Perhaps the most sophisticated weapon now being used against the disease is the trapping of adult beetles with baits of chemical attractants. Researchers at the State University of New York College of Environmental Science and Forestry at Syracuse, in cooperation with scientists at the U.S. Forest Shade Tree Laboratory, in Delaware, Ohio, isolated three beetle attractants. One of these substances is produced by fungus-infested or moribund bark; the other two are elaborated by virgin European beetles. In nature the action of these substances results in the mass attraction of elm bark beetles to a single target tree; hence, the spectacularly contagious nature of the disease.

Synthetically produced, these attractants have been used effectively in the baiting and trapping of the European elm bark beetle, but practical problems in the application of the baiting method may continue to be serious obstacles where it is intended to reduce beetle populations. The method may have greater utility, in the long term, for simply monitoring the presence of beetle populations. Some Chicago-area agencies are currently using the baiting method for this purpose.

Resistant Hybrids: The Ultimate Solution?

The most promising solution to the Dutch elm problem yet advanced may lie in the development of resistant hybrids, an area of investigation that is being pursued by a number of horticulturists around the country, notably George Ware, research group administrator at Morton Arboretum, Lisle, Illinois. Ware is particularly interested in the potential of the Japanese elm, *U. japonica*, and the Siberian elm, *U. pumila*, both of which show a high degree of resistance. Ware is hopeful that crossing these with other Asian species, particularly those showing high stress tolerance for urban conditions, could result in a fertile hybrid that combines all the desired features, in addition to being resistant. Of all the avenues toward an effective weapon in this battle, plant breeding is the slowest; but there are those who believe it may be the ultimate answer.

Meanwhile, the best course of action for the private property owner who wishes to safeguard his elms from infestation or who suspects that his trees already have the disease, is to consult a local arborist. Chicago-area property owners may contact the Cooperative Extension Service (University of Illinois), in Rolling Meadows, Illinois.□

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[1]D.B. Roden: "The potential for selection for freeze-tolerance in an Ontario population of *Scolytus multistriatus* (Coleoptera: Scolytidae)," in *Canadian Forestry Service Research Notes* (1981) 1 (3) 17-18. Published by Great Lakes Forest Research Centre, Sault Ste. Marie, Ont., Canada.

[2]V.R. Landwehr, et al: "Attraction of the native elm bark beetle to American elm after the pruning of branches," in *Journal of Economic Entomology*, (1981) Vol. 74, 577-580.

[3]"Dutch Elm Disease," by Gary A. Strobel and Gerald N. Lanier, in *Scientific American*, August 1981, p. 66.

[4]Webber, J.: "A natural biological control of Dutch elm disease," in *Nature, UK* (1981) 292 (5822) 449-451.

FIELD BRIEFS

Prince Philip, the Duke of Edinburgh

Prince Philip, Duke of Edinburgh, Chairs November 8 Symposium

Prince Philip, Duke of Edinburgh, president of World Wildlife Fund-International, will chair a symposium on "Tropical Forests: Vanishing Cradle of Diversity" in James Simpson Theatre on Monday, November 8, at 6:00 p.m.

Taking part in the symposium will be Dr. Lorin I. Nevling, Jr., director of Field Museum; Dr. William Burger, chairman of the Department of Botany; Dr. John W. Fitzpatrick, associate curator and head, Division of Birds; and Dr. Peter H. Raven, director of the Missouri Botanical Garden and professor of biology at Washington University, St. Louis.

Following the symposium, His Royal Highness will be guest of honor at a black tie reception and dinner in Stanley Field Hall. The reception begins at 7:00 p.m. Hosting the event are Mr. and Mrs. T. Stanton Armour; Mr. and Mrs. Marshall Field; Mr. and Mrs. Brooks McCormick; Mr. and Mrs. James O'Connor; and Mr. and Mrs. Jeffrey R. Short, Jr.

Tickets for the combined symposium and dinner program are $250 per person, with reservations available on a first come, first served basis. Checks should be made payable to World Wildlife Fund-U.S. Proceeds will benefit World Wildlife Fund-International, World Wildlife Fund-U.S., and the Botanical Program of Field Museum of Natural History. Inquiries about where to send payment and other matters may be made by calling the Women's Board Office, (312) 322-8870.

World Wildlife Fund is a private, international conservation organization dedicated to preserving endangered wildlife and habitats throughout the world and to protecting the biological resources upon which human well-being depends. Its activities are scientifically based, aim to produce immediate and long-term conservation benefits, and provide models for natural resource management techniques and policies.

Field Museum is the final stop in a series of 1982 visits to the United States by Prince Philip on behalf of the World Wildlife Fund. Previous stops include Los Angeles and Houston.

The People and Art of the Philippines *continues in Hall 26 through December 31.*

Photo by Ron Testa. 83435

A Critical Time in Government Funding

A $30 million Chicago Park district matching bond issue for capital improvements at eight Chicago museums, including Field Museum, located on Chicago park land failed to win approval at the June session of the Illinois State Legislature. As a result, the museums will have to wait until the next legislative session for the bond issue to be reconsidered.

Under the proposal, Field Museum would have received $6,700,000 for building renovation, which sum would have had to be matched dollar-for-dollar with privately raised funds.

The Illinois General Assembly did approve state grants to museums on public lands in Illinois totalling $1 million for the fiscal year, which began July 1, 1982. Although Governor Thompson had eliminated all state support for museums in his budget proposal, he signed the appropriation bill in July. Field Museum expects to receive about $174,000 from this appropriation.

At the federal level, Congress rejected President Reagan's proposal to rescind $11.5 million for the Institute of Museum Services in fiscal 1982. The President's budget calls for elimination of all funds for the Institute in fiscal 1983 and for substantial cuts in appropriations for the National Endowments for the Arts and Humanities. Congress has not yet acted on these recommendations.

"The country is experiencing difficult economic times and museums expect to share equitably in government cutbacks," commented Willard Boyd, president of Field Museum. "However, museums have been asked to take 100 percent cuts in some state and federal programs. That is more than their fair share.

"While less than 40 percent of Field Museum's operating expenditures come from government funds—local, state, and federal—the public funds provide unrestricted support to heat, light, maintain and operate the Museum."

Ownership, Management and Circulation

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Total paid circulation	35,823	32,243
Free distribution	670	670
Total distribution	36,493	32,913
Office use, left over	2,551	2,287
Total	39,044	35,200

I certify that the statements made by me above are correct and complete. *Andrea G. Bonnette*, vice president for Finance and Museum Services.

October and November at Field Museum

October 16 through November 15

Continuing Exhibits

"The People and Art of the Philippines." Through December 31. A stunning exhibit containing some of the finest examples of Philippine art from prehistoric times to the present. The 420 objects have been gathered from 29 private sources and museums, including the Field's fine collection. Special emphasis is given to the prehistoric ceramics and gold, church art from the Spanish colonial period, wood sculpture from the northern tribal peoples and exquisite woven, beaded, and embroidered textiles from southern Philippine peoples. Hall 26, second floor.

"Maritime Peoples of the Arctic and Northwest Coast." Field Museum's landmark permanent exhibit compares and contrasts the way Eskimos and Northwest Coast Indians have adapted to widely differing environments along the continuous northern Pacific and Arctic coastlines. The two groups have flourished since prehistoric times by harvesting the riches of the oceans. The five sections of the exhibit use displays, films, and full-sized replicas to depict the origins, food-gathering techniques, social life, spiritual beliefs, and art of these peoples. Here is an exhibit so big you'll want to return to it often for new insights into how these unique cultures existed in harmony with their surroundings. Hall 10, first floor.

"Man in His Environment." The information contained in this multimedia exhibit reinforces the thrust of many of Field Museum's October programs, especially "Extinction," the October 17 lecture by Dr. Paul Ehrlich. It uses films and displays to describe the ecological relationship of plants and animals to their surroundings and defines man's effect on this delicate balance. Learn how man is consuming the irreplaceable resources of the earth, poisoning the air, land, and waters and disrupting nature's equilibrium. Discover some of the alternatives to our current destructive ways and ponder whether we are willing to make the adjustments necessary to reverse the process. Hall 18, first floor.

"The Last and the First Eskimos." Opened October 9. This photographic study is the joint effort of photographer Alex Harris and child psychiatrist Dr. Robert Coles. It documents the white man's influence during a transitional period in the history of Alaskan Eskimos. Through January 23, 1983. Special exhibit area in front of Hall 9, first floor.

New Programs

"Extinction," Ray A. Kroc Environmental Lecture by Dr. Paul Ehrlich. To Dr. Ehrlich, internationally known author, scientist, and Stanford University professor, the fate of the human species depends on maintaining the planet's current diversity and abundance of life. He feels that without the free "public services" this viable ecosystem provides, such as water purification, soil creation, waste disposal, and pest control, there could be no civilization and perhaps no human life. Yet mankind is destroying the very system that our welfare depends upon. We are forcing extinction of species at a rate which greatly exceeds the rate of any natural processes to replace them. Hear Dr. Ehrlich's thoughtful arguments and his positive proposals to reverse the tide toward species extinction. Don't miss this important lecture! Sunday, October 17 at 2 p.m. in James Simpson Theatre. Members: $3; nonmembers: $5.

The Paul Winter Consort. Celebrate ethnic traditions in harmony with the natural world through the free-spirited music of this inventive group. Their music unites the styles of jazz, symphony, Latin American, and African music with natural sounds of wolves, whales, wind, and water. A lively evening designed to reawaken the natural resources of harmony and rhythm within us all! Order your tickets early for this special event. Tickets will be sold at the door on a space available basis only. Friday, October 22 at 8 p.m. in James Simpson Theatre. Members: $8; nonmembers; $10.

Parent/Child Workshops. Registration opens October 1 for this fall's sessions. Parent-child teams can work on a craft project or join a participatory event. Topics include paper-making, bookbinding, Inca techniques for pottery making and dinosaur mural painting. Sessions keyed to child's age. Detailed brochure will be mailed to Members or available from Education Department. Workshops will be held November 6, 14, and 20.

Continued on back cover

October and November at Field Museum

Continued from inside back cover

"The Last and First Eskimos" An illustrated lecture by photographer Alex Harris in conjunction with the exhibit of his work now on display at Field Museum. Harris describes his life and work among the Eskimos, recording their culture at a critical point in its history. November 14 at 2 p.m. Members: $3; nonmembers $5. Enter through the West Entrance.

Continuing Programs

"Edward E. Ayer Film Lecture Series. Travel around the world via film every Saturday afternoon in October and November. Narrated by the filmmakers themselves, these free 90-minute film/lectures are recommended for adults. The films begin at 1:30 p.m. in James Simpson Theatre. Admission is through the West Entrance. Members receive priority seating. Oct. 16, "Scotland"; Oct. 23, "Japan"; Oct. 30, "Great Train Trip Across Siberia"; Nov. 6, "Greece"; Nov. 13, "Mexico."

Fall Journey. "Autumn Walkabout" is a self-guided tour of Field Museum exhibits and dioramas that mirror what you can see outside in Chicago during the fall season. Free *Journey* pamphlets available at Museum entrances.

Weekend Events Line. A prerecorded telephone message gives up-to-date information about such weekend events as Discovery Programs, Family Features, films, and special programs. Call (312) 322-8854 weekends.

Weekend Discovery Programs. New vistas of natural history are opened through these tours, films, slide programs, and participatory activities. October's programs entitled "Cetaceans, Pinnepeds, and Sirens of the Sea," are planned around sea mammals. History and legend once depicted them as mermaids or monsters of the deep, but recent scientific research into the social lives and communication systems of whales, dolphins, seals, and otters have shown them to be complex, highly intelligent creatures. Oct. 16: 2 p.m., "The Orca Whale"; 3 p.m. "Greenpeace—Voyages to Save the Whales," discussion session led by Greenpeace Director Diane MacQuillan to follow; Oct. 23: 2 p.m., "Whales, Dolphins and Men"; 3 p.m., "Whales: Mystery and Magnificence in the Deep"; Oct. 30, 2 p.m., "Jojoba"; 2:30 p.m., "The Great Whales." Two Egyptian tours have been scheduled in November. They are: Nov. 6, 11:30 a.m., "Ancient Egypt; and Nov. 7, 12 noon, "Preparation for After Life in Ancient Egypt."

Family Feature. "Tagging Whales." In conjunction with October's *Discovery Programs*, "Cetaceans, Pinnepeds, and Sirens of the Sea," this Family Feature is designed to familiarize young visitors with the whale family (cetaceans). Children can net a paper whale in a make-believe ocean, identify their catch, and take home a properly "tagged" whale. Saturday and Sunday, October 16 and 17, from 12 noon to 2 p.m. in Hall 19.

Museum Hours. The Museum is open daily from 9 a.m. to 5 p.m. Free day is Thursday.

The Museum Library is open weekdays from 9 a.m. to 4 p.m. Obtain a pass at the reception desk, first floor.

Museum Phone: (312) 922-9410

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

November 1982

Field Museum of Natural History Bulletin

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COVER

"Ziggy," Brookfield Zoo's famed elephant in 1973. The bones of this exceptionally large Indian elephant now reside in the Field Museum collection. Ziggy died in 1975. For more on Ziggy, see page 4. Photo courtesy Chicago Zoological Society.

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FIELD BRIEFS

James W. Valentine 84553

Jin Yu-gan 84552

Peter W. Galton 84550

Visiting Scientist Program

Field Museum's Visiting Scientist Program, initiated in 1979, continues to attract geologists and paleontologists from the United States and abroad. Under the program, scientists are given space and facilities for research at the Museum, the opportunity to work with the Museum's collections, and to collaborate with the Field Museum's own staff.

Recent visiting scientists under the program included Jin Yu-gan, associate researcher at the Nanjing Institute of Geology and Paleontology, Academia Sinica, of the People's Republic of China; James W. Valentine of the Department of Geological Sciences, University of California, Santa Barbara; and Peter W. Galton, of the University of Bridgeport, Bridgeport, Conn. Mr. Jin and Dr. Valentine are invertebrate paleontologists; Dr. Galton is a vertebrate paleontologist who was here to study Field Museum's type specimen of *Brachiosaurus altithorax,* one of the largest dinosaur species known.

Peter R. Crane Joins Staff

Paleobotanist Peter R. Crane joined the Department of Geology staff in September as assistant curator. He received his undergraduate degree and doctorate at the University of Reading, England, and served with Reading's Department of Botany from 1978 to 1981. During the past year Crane has been a visiting research scholar at Indiana University, working on some of the earliest known fossil flowers.

His research has centered on the fossil history and evolution of flowering plants, but his interests cover all aspects of paleobotany and their relevance to understanding plant evolution.

A Founders' Find

On September 30, housekeeper Tony Valentino was watering plants in the Founders Room. To his amazement, a one-inch adult land snail with greenish-yellow shell and brown body crawled from the base of a tree.

Alan Solem, curator of invertebrates, identified the snail as *Zachrysia (Chrysias) provisoria* (Pfeiffer, 1858). There is no common name for this species that originally lived in Cuba. Whether it was native to Nassau, Bahamas, or introduced there is uncertain, but by 1956 it had been accidentally introduced into south Florida. Today it has a moderately wide distribution in Florida and occasionally travels north on ornamental plants and thus unexpectedly adds to the decor in greenhouses, homes, and even Founders' Room at Field Museum.

Nicknamed "Zach," it now resides in the Division of Invertebrates.

"Zach," surprise visitor in Founders Room 93432

"Ziggy" Finds New Home at Field Museum

by Michael Reed and Jean Sellar

preparators, Division of Mammals

Lore from tribes as disparate as the Bongos of Sudan and the Kurrabas of Sri Lanka has it that elephants die in secret graveyards scouted by warder elephants who protect the bones from desecration. Persistent ivory hunters have failed to discover any such graveyards, although the paucity of observations of elephants dead from natural causes has led to speculation that the carcasses are gathered in one place. Possibly elephants often die in or near water and their dense bones quickly sink into mud. Certainly the decomposition and dissolution of even so large an animal occurs very quickly in tropical areas.

L. Belmont

Michael Reed and Ziggy's skull before processing

But there is a deposition of elephant bones much closer. Right here at the Museum in the Division of Mammals there are bones from numerous elephants. And the collection has just received one of its most impressive members to date, Ziggy.

Ziggy was notorious both for his size and for being a "rogue male." Of the two, his reputation for size was far better deserved. Asian elephants (*Elephas maximus*) like Ziggy seldom exceed 11,000 lbs.; however, Ziggy weighed in at approximately 13,000 lbs. African elephants (*Loxodonta africana*), the larger of the modern-day species of elephants, rarely reach Ziggy's size, although some field estimates of wild bulls have gone much higher.*

Legend has it that Ziggy killed two men before he came to Brookfield Zoo, one in Europe and one in San Diego. However, there is no evidence of any kind that Ziggy ever caused human deaths. In 1941 Ziggy did charge, pin, and start to crush his keeper, the skilled elephant trainer, George "Slim" Lewis. It is probable that the nearly fatal attack failed only because Ziggy's lengthy tusks got in the way. At the time of the attack, Ziggy was in a poorly understood condition called musth, which is linked with irritable and aggressive behavior in male Asian elephants.

Ziggy was brought to the U.S. in 1920, when about two years old. Florenz Ziegfeld, the showman, was at the New York dock when the young elephant, then called "Herman," was being unloaded. Impetuously, he bought him as a present for his daughter, but a string of mishaps convinced Ziegfeld that even juvenile elephants do not make suitable pets. Ringling Bros. Circus bought the elephant, then sold him to Singer's Midgets Circus, who named the elephant after his earlier owner.

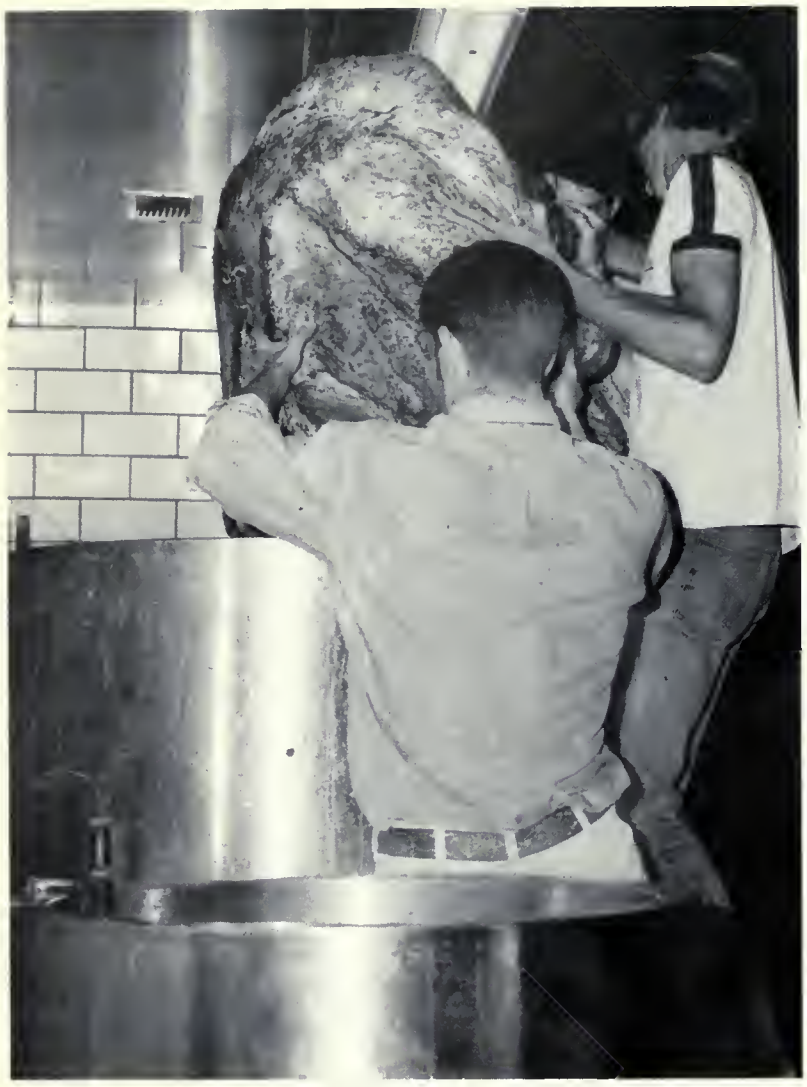
The circus traveled with the renamed Ziggy

*An African elephant in the collection of the Smithsonian Institution is estimated to have weighed 20,000 lbs.

*Bones in the Division of Mammals collection: (from left) femurs of Ziggy (*Elephas maximus*), giraffe (*Giraffa camelopardalis*), black rhinoceros (*Diceros bicornis*), greater kudu (*Tragelaphus strepsiceros*), and Dall sheep (*Ovis dalli*). Group of smaller bones belong to hyrax (*Procavia capensis*). 93431*

dancing "the lurch" and playing the harmonica all over the U.S. and Europe. Male Asian elephants become sexually mature at 14 to 15 years of age; when Ziggy was a little older than this he began to be willful and uncooperative. As a result, Ziggy was sold to Brookfield Zoo in 1936, where he stayed until his death in 1975.

After the attack on his keeper, Ziggy had to be confined indoors. A major fund-raising campaign by the zoo, with notable contributions from schoolchildren, allowed the construction of a large, safe indoor-outdoor enclosure. Ziggy had a popular "coming-out" party in 1971 when the work was completed. He made the news again four years later when an exploratory attempt to help his keeper open the shift door resulted in Ziggy falling into his 10-foot-deep moat. Winches were necessary to haul him upright, and 100,000 lbs. of limestone were brought in to form a ramp for him to walk out. He refused to do so, even when bribed with his missed daily 400-lb. meal. Finally, the old bull responded to the presence of a young female and walked up to his enclosure 30 hours after he had fallen.



Above: *(from left) curator Bruce Patterson, preparator Michael Reed, and collection manager Robert Izor lower Ziggy's skull into 224-gallon steel kettle.* Below: *Michael Reed removes soft tissues from around bones of skull.*

Belmont

Several attempts were made to mate Ziggy, but no offspring resulted. Attempts to breed captive elephants are seldom successful, which is unfortunate, since both the population and range of the two elephant species has declined.

Whenever a new specimen is to be added to the Mammal collection, a determination must be made as to the best preparation method for long-term storage. The use of dermestid beetles is preferred for processing skeletal materials because their tiny mouthparts can remove flesh from skeletons without damaging or disarticulating the specimen.** However, maintenance of a beetle colony big enough to process animals larger than deer is difficult.

The escape-proof cages containing the beetles take up too much room, and it can be difficult even for the Field Museum to provide enough food in the form of animal carcasses to keep so large a colony going over a period of time. Fats and oils are not completely removed from large specimens by beetles, and the specimens dry out and become unappetizing before the beetles can finish them. The most important maintenance consideration is that the large size of the beetle population in such a container makes it impossible to exercise the precise controls necessary to protect small delicate mammals from damage during processing. Therefore, we prefer to use several medium-size beetle colonies in 20-to-30 gallon tanks instead of one large 100-gallon colony.

There are a great many other methods of cleaning specimens to choose from: maceration, dissolving tissues with acids or alkalis, boiling in water or ammonia, or digesting with enzymes. The method we chose for Ziggy was cooking at 160°F with laundry enzymes and detergent.

Our large mammal preparation equipment, located on the third floor in the Ellen Thorne Smith Bird and Mammal Study Center, consists of two gas burners, a variety of 3-to-10 gallon pots, and two steam-jacketed stainless steel kettles, one with a 60-gallon capacity, the other with a 224-gallon capacity. The size and condition of the specimen determines which is to be used. The gas burners and pots are used for dog- to sheep-size animals or parts of larger animals that require special attention, such as joints that must remain articulated. The two steam-jacketed kettles are used for sheep- to elephant-size animals. Ziggy's skeleton was prepared using this latter equipment.

As with all cooking, there is more to this process than merely heating pots of water. Holes

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**See "Dermestids," by Robert M. Timm, February, 1982 *Bulletin*.

are first drilled in the long leg bones to aid marrow removal. If more than one animal is to be processed in the same kettle at one time, each animal (or its parts) is individually placed in a nylon mesh bag. Degreasing and softening of tissue is accelerated by the use of household laundry detergent; both an enzyme and nonphosphate detergent are used. The specimens are cooked until the tissue covering the bones reaches a gelatinous consistency. It may take as little as several hours or as long as several days to obtain the desired results. The water is changed between each step and the specimens are rinsed thoroughly to remove detergent residue. We then use a soft wire brush, scissors, or cartilage knife to remove any remaining tissue or detergent residue.

The clean bones are spread out to dry. The long leg bones are especially susceptible to cracking at this stage. Covering these bones with blotting paper slows the drying process and prevents drastic cracking. Although the bones of an elephant like Ziggy are many times larger than the bones of most animals we deal with, they are prepared in the way just outlined. The only difference is that far more time is needed to process elephant bones.

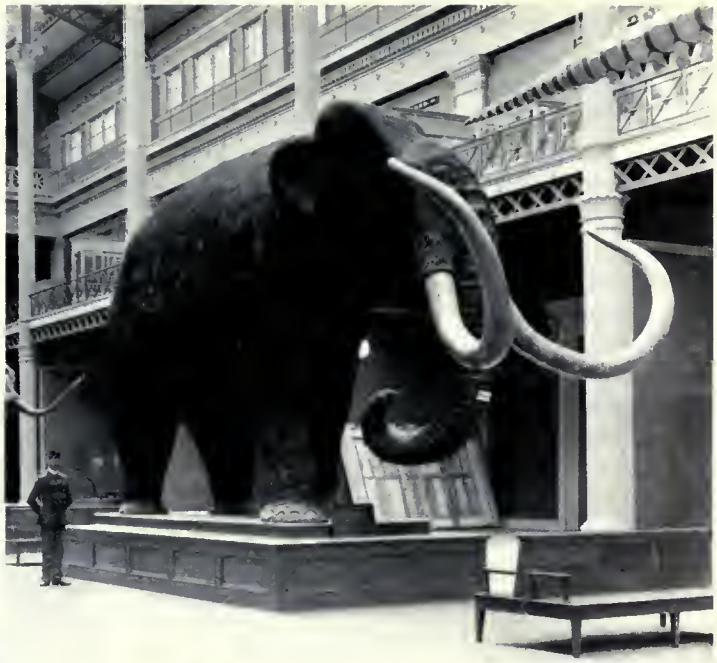
The stresses put on individual bones by changes in water temperature, laundry detergent, and the drying process are major drawbacks to this method. We brush on and inject into crevices a dilute solution of a plastic-like material (glyptal) to harden weak spots and prevent cracking of teeth. The specimen is now ready to be cataloged and numbered. Large specimens, like Ziggy, are installed directly into the storage cases of the research collection; whenever possible, specimens are boxed and labeled before installation.

Our work in the Zoology preparation lab is not for taxidermic purposes. The majority of exhibits are permanent, so preparation efforts have shifted towards scientific applications. Individual bones are more readily handled and measured when not wired together, as in a mounted skeleton. However, we do receive a number of inquiries every year from people interested in preparation of skeletal material. They need only follow the basic procedures outlined above. An excellent source of additional information is *Anatomical Preparations*, by Milton Hildebrand (University of California Press, 1968).

This story has not ended the saga of Ziggy, for his final resting place is in a research collection of worldwide coverage and importance. The research collection is utilized through loans made to and visits from qualified scientists from this country and around the world. We welcome Ziggy as a valuable addition to our collection. □

L. Belmont

Above: *Jean Sellar (left), Michael Reed and Bruce Patterson with one of Ziggy's tusks.* Left: *The cleaned skull is ready to be stored in the research collection. Pelvic bones are in kettle.*



Elephants and Taxidermy

A brief span of time—perhaps fifteen years at most—separate the Dumbolike representation of Indian elephants above and the stunning lifelike African elephants at the right. The Indian elephants and their cousin, the mammoth, upper right, were on view in the 1890s at Field Museum's first quarters—the building which had served as the Palace of Fine Arts, in Jackson Park, during the World's Columbian Exposition. (At its founding in 1893 the museum was named "The Columbian Museum of Chicago"; the following year the name was changed to "Field Columbian Museum." Shortly before the death of founder Marshall Field in 1906, the name was again changed to "Field Museum of Natural History.")

The pair of African elephants at right were acquired by then chief taxidermist Carl Akeley during a 14-month expedition to Africa in 1905-06. They may still be seen, of course, in Stanley Field Hall, every bit as impressive and lifelike as when mounted more than 70 years ago. The Indian elephants and the mammoth were disposed of before the museum moved to its present building in Grant Park in 1921.

TOURS FOR MEMBERS

James Swartchild

Feluccas on Nile

Egypt Tour with Nile Cruise

January 7-26

Our Egypt tour offers a rare opportunity for in-depth visits to the treasures along the Nile under the leadership of Mrs. Del Nord, doctoral candidate in Egyptology at the University of Chicago.

The itinerary will include Cairo, Memphis, Sakkara, Aswan/Abu Simbel, Edfu, Esna, Luxor, Thebes, the Valley of the Kings and Queens, Dendereh, Abydos, Amarna, Middle Kingdom tombs at Beni Hasan, the pyramid at Medum, and much more. The tour also includes an 11-day Nile cruise on a chartered, modern Nile steamer, *The Sphinx*. The tour price is $4,200 per person based upon double occupancy. This includes all air transportation, meals, Nile cruise, hotels, tips, taxes, transfers, visa fees, admissions, baggage handling, escorts, and more.

Since advance bookings have already been made for this popular tour (limited to 30), only a few accommodations remain; early enquiries, therefore, are suggested. Reservations will be honored in the order received.

New Providence and Andros Islands Ecology Tour

February 24-March 5, 1983

If you think "it's better in the Bahamas," but are looking for more than just a perfect beach, our 10-day study tour to the Bahamas' New Providence and Andros Islands will offer that extra dimension for you.

Departure from Chicago's O'Hare Airport is scheduled for Thursday, February 24, for Nassau, on New Providence Island. While in Nassau the city tour will include Blackbeard's Tower, old village of Fox Hill, the farming area, Lyford Cay, and other points of interest. There will be an opportunity for you to meet Bahamian government dignitaries and other notable experts.

On Monday, February 28, we'll fly (12-minute flight) from Nassau to the tranquility of Andros Island. One of the special features of this trip is the unique opportunity to spend six days on this out island at a comfortable lodge (not open to the public) with private cottages right on the ocean's edge. Air conditioning is provided by the fresh breezes from the sea. The beach begins at the cabin door. Our meals in the dining room of the main lodge will be delicious and plentiful, with many Bahamian specialties.

The magnificent Andros Barrier Reef is one mile offshore, about a ten-minute boat ride, and the marine life on the reef is fantastic. We will be able to study the reef from boats especially constructed for this purpose. If you prefer to snorkel, there will be equipment for your use.

There will be nature walks on both islands, with emphasis on plant and animal life. We'll visit a delightful village where the natives will be involved in the local industry of hand printing fine cloth, and we'll explore an experimental farm in operation.

Margaret Rabley, a dedicated environmentalist, will be our guest lecturer. Mrs. Rabley lived for the past ten years in the Bahamas, where she was science coordinator and lecturer at the College of the Bahamas. She has written several books on the wild flowers of the Bahamas and Caribbean, and her research work covered many aspects of Bahamian plant and animal life.

This tour will be modestly priced, and fills up rapidly. The maximum number of participants is 25. We hope you will make your reservation early. Please telephone (our direct telephone number is 312-322-8862) or write to FIELD MUSEUM TOURS.

Margaret Rabley

Nassau byway

THE LAST AND FIRST ESKIMOS: PHOTOS BY ALEX HARRIS

On view in Hall 9 through January 23

First Communion day, Tununak, May 1978

Alex Harris and Dr. Robert Coles went to Alaska for the first time in 1973, to conduct research for a new volume of the series "Children of Crises." Their study of children soon became a study of village life. Since that first trip they have returned to Alaska many times - sometimes together, more often separately - but always remaining in touch and sharing their experiences. Many of the Harris photographs, together with an extensive text by Coles, were published as *The Last and First Eskimos* by New York Graphic Society in 1978.

Harris set out to photograph several remote rural villages where Eskimo traditions still persist. Cultural and environmental changes are occurring so fast in Alaska that many of the photographs have already acquired an historical perspective. By 1981, for instance, most of the residents of Shungnak had moved to new government housing, about a mile from the village Harris photographed.

In the areas Harris photographed, a subsistence way of life exists side-by-side with the cash-job economy, and both offer viable options. These are villages where a grandfather cannot speak with his grandchildren because they speak different languages. It is this complexity - and the dignity of the people which has somehow remained intact - that Harris saw and set out to record and, in fact capture so well. □

Eskimo dancing, Tununak, April 1976

Daughters of George and Sophie Cleveland, Shungnak, October 1975

Native American Tourist Crafts
A 19th Century Example from Alaska

by James W. VanStone
Curator of North American Archaeology and Ethnology

We usually associate native American crafts made specifically for the tourist trade with curio stores in Wisconsin Dells or roadside stands near the pueblos in New Mexico. It should be kept in mind, however, that the term "tourist" can be applied not only to those who visit exotic areas and cultures today, but also to those who traveled in frontier regions at a relatively early date. The fact that such individuals were usually in these remote regions for business rather than pleasure is not necessarily relevant. A tourist can be defined as anyone whose interest is stimulated by environments and ways of life different from his own, and who desires to acquire souvenirs of his experiences.

In Alaska such early tourists included gold miners, commercial whalers, and members of exploring and scientific expeditions who, beginning in the 1850s, came to the territory in ever-increasing numbers. At first these visitors purchased, as mementoes of their experience, items of material culture made by Eskimos and Indians for their own use. As the demand increased, however, the native peoples of Alaska went to work to produce items specifically for trade. Examples of this type of "market art" made by 19th-century Eskimos include the engraved ivory pipes, ivory carvings, and elaborate skin bags that can be seen in the new exhibit, "Maritime Peoples of the Arctic and Northwest Coast," in Hall 10.

One of the most unusual examples of 19th-century Eskimo market art in the Field Museum collection—an item of craftsmanship that tells us a good deal about native life—is a model of a *qasgiq*, or ceremonial house. The model is part of a collection of ethnographic material made by Marcus O. Cherry along the lower Yukon River for the World's Columbian Exposition. From July, 1889 until the summer of 1892 Cherry was an employee of the Episcopal mission at the Ingalik Indian village of Anvik, on the lower-middle Yukon River. He traveled extensively and his collection, mostly Eskimo material, was exhibited in the Anthropological Building at the Exposition and afterwards transferred to the newly established Field Columbian Museum (later to be named Field Museum of Natural History), which accessioned it on October 31, 1893.

A *qasgiq* was the most conspicuous structure in any Eskimo village in western Alaska. Although similar in construction to family dwellings, it was much larger and usually located on the highest plot of ground or in the center of a community; larger communities had more than one. A *qasgiq* was generally square, as much as 25 feet (7.6m) on a side, and had a single raised bench around the walls.

A *qasgiq* had many functions, but most importantly it was the central place in the lives of men. In addition to being their eating and sleeping place, it also served as a workshop where tools and hunting and fishing equipment were made. A boy went to the *qasgiq* to live when he was about five years old and it was there that he learned the techniques and lore of his culture by watching the craftsmen at work and listening to stories of great events of the past told with enthusiasm by the oldest men.

Among the most enjoyable activities occurring in the *qasgiq* were sweat baths taken by the men and boys at frequent intervals during the winter. Edward William Nelson, a collector of ethnographic material in Alaska for the Smithsonian Institution in the early 1880s, has described these baths in graphic detail:

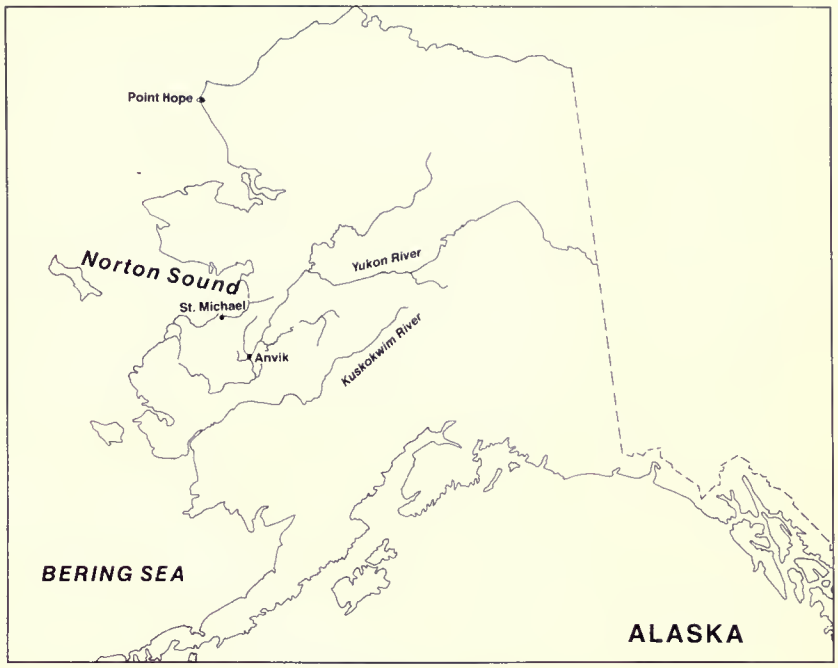
> *Every man has a small urine tub near his place, where this liquid is saved for bathing. A portion of the floor in the center of the room is made of planks so arranged that they can be taken up, exposing a pit beneath, in which a fire of drift logs is built. When the smoke has passed off and the wood is reduced to a bed of coals, a cover is put over the smoke hole in the roof and the men sit naked about the room until they are in profuse perspiration; then they bathe in the urine, which combines with the oil on their bodies, and thus takes the*

place of soap, after which they go outside and pour water over their bodies until they become cool..... [Because of the intense heat] the bathers are obliged to use respirators [made of grass] to protect their lungs.[1]

Although the *qasgiq* was normally the domain of men and boys, on special occasions it served as a general meeting place. Many of the important ceremonies were also held in the *qasgiq*, including dances and feasts which honored the dead and propitiated the spirits of game animals. Most of the time women were permitted in the *qasgiq* only when they brought food for the men, but on some occasions the whole community was present.

Nelson has described and illustrated a typical *qasgiq* found in villages from Norton Sound south to the Kuskokwim River (fig. 3). Its main room had a plank floor, benches for sitting and sleeping, and lamp stands where pottery lamps burning seal oil helped to alleviate the gloom in this semisubterranean structure. The walls, made of horizontal logs or vertical planks, were seven or eight feet high and the roof was cribbed with a central skylight and smoke hole.

In summer the *qasgiq* was entered through a passage at ground level, but in winter the inside door was sealed and the occupants entered through an underground passage emerging through a hole in the plank floor near the fireplace. It was this part of the plank floor that could be removed when a fire was built for the sweat baths.



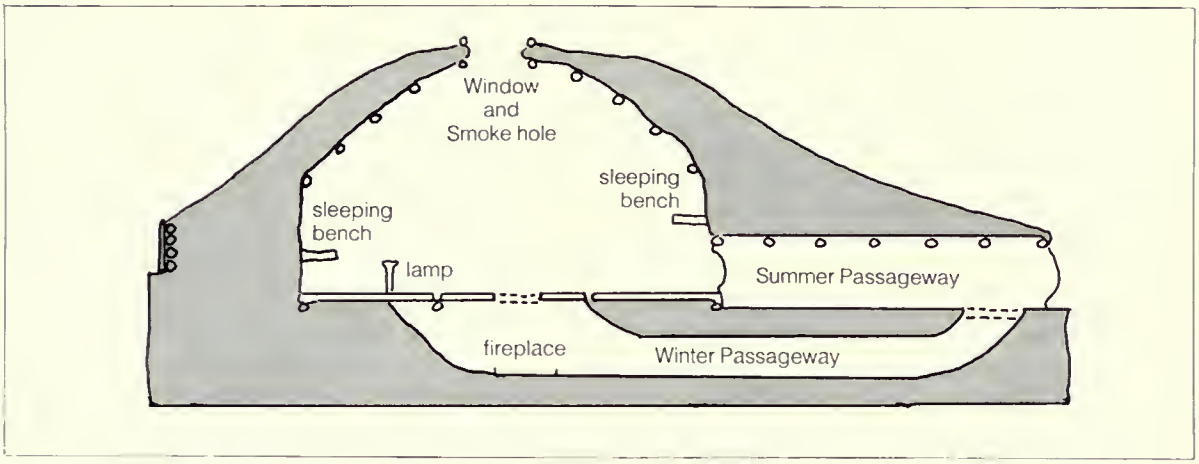
In winter too, the entrance tunnel served as a cold trap, helping to keep the interior of the *qasgiq* warm. Like family dwellings, the wooden structure of the *qasgiq* was covered with earth and a layer of sod. Even without a fire it remained warm in winter and the residents were frequently stripped to the waist or completely naked. On the side and back platforms each man had his own place. Elderly men of high status and important visitors from other villages occupied choice places in the back

1

2

corners while younger men were obliged to content themselves with places closer to the drafty entrance.

The model *qasgiq* collected by Marcus Cherry for the World's Columbian Exposition lacks a specific provenience, although we know that it represents the type of structure described by Nelson and characteristic of communities on the lower Yukon River and vicinity. On this specimen someone has written "St. Michael" in pencil, so it is possible that the model was collected in that coastal village north of the mouth of the Yukon.



3

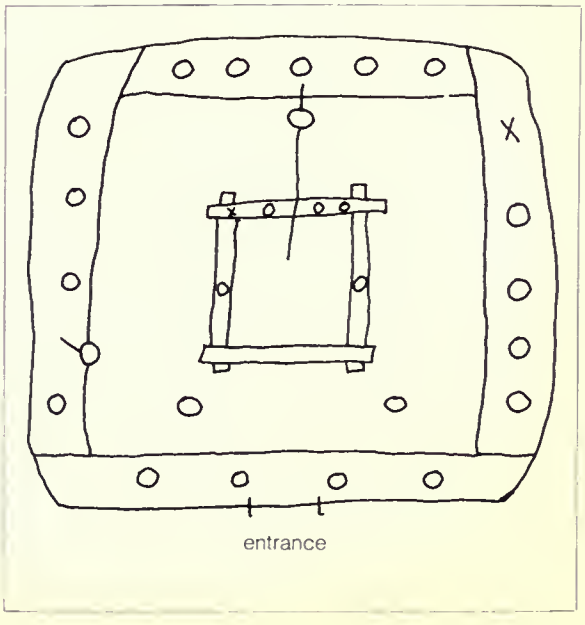
Courtesy Smithsonian Institution

The front and two sides of this model, which is approximately 35 cm square and about 40 cm high in the center (about 14 by 16 inches), are constructed of single pieces of wood, slightly curved by steaming, and lashed together at the corners with spruce root (fig. 1). The back consists of two overlapping pieces lashed with root, while the bottom is a single piece lashed at intervals to the sides. Around the upper edges of the sides are four shaped strips of wood, forming a rim which is held in place with wooden pegs. In the center of the front piece near the bottom edge is a square opening, which represents the entrance from the summer passageway into the main room of the *qasgiq*.

The cover of the model is a stylized representation of the structure's roof. The cribbing is in the four corners so that no center posts are required. This cover consists of four triangular pieces lashed together with root near the top and bottom. At the top is a square opening to admit light and release smoke. It is covered with a small piece of seal intestine held in place by a framework of four narrow strips of wood pegged in place. The roof-cover is hinged to the main body of the structure along one side with three strips of sealskin. On the opposite side is a broken loop handle of the same material.

In the interior of the model there are strips of wood approximately 6cm wide along all four sides, pegged in place and also lashed to the sides, which represent the benches. On these benches are crude wooden figures representing persons taking part in a ceremony, five along the back and on one side, six (two of which are missing) on the other, and four along the front (figs. 2, 4). Worked to a pointed peg at the base, which extends through a hole in the bench, these figures lack arms and legs and the features are crudely indicated. In the center of the back bench, facing the entrance, is a single figure raised above and in front of the others on a thin stick; the figure holds a long stick pointed forward toward the entrance. A similar figure on the left bench (barely visible in figure 2) lacks the horizontal stick. Unlike the other figures on the benches, these two have legs. They also have small wooden pegs on each side of the head, possibly representing antlers.

Below the benches, on the floor of the *qasgiq*, is a square framework of narrow strips of wood, pegged to the bottom piece, which originally held six figures. Three of these are along the



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back (partially visible in figure 2), a fourth is missing, and there is one on each side. The entrance is flanked by a figure on each side; the bases of these two figures, which face the back bench, form long pegs inserted directly into the floor of the *qasgiq* (fig. 4). In the brief notes which accompany the Cherry collection, these two figures are identified as shamans, the traditional Eskimo religious practitioners who served as intermediaries between ordinary people and the spirit world.

Although it is impossible to say with certainty which ceremony is being celebrated in this model *qasgiq*, Nelson tells us that the presence of long wooden rods is associated with the Great Feast of the Dead, a common festival in one form or another all along the coast of western and northwestern Alaska. In this ceremony the nearest blood relative of a deceased individual honored his spirit with presents of food, drink, and clothing. This was accomplished with the assistance of the dead man's namesake at the first Festival of the Dead following the former's death. At this time only small offerings of food were presented, but all effort was directed toward the Great Feast of the Dead.

After the passing of one or two years, the chief mourner began to accumulate valuable articles such as furs of various kinds, clothing, and food. He or she frequently saved for as many as six or more years until the store of goods had grown considerably. At the same time, other chief mourners were doing the same thing and eventually several individuals would conclude that they had saved enough to make one of these great festivals. The ceremony, when it occurred, lasted five or more days and resembled, in some respects, the potlatch on the Northwest Coast. The Great Feast of the Dead was one of the most common ceremonies in the St. Michael area and runners were sent to neighboring villages with invitations. Most ceremonies held in the *qasgiq*, whatever their origin, sought in one way or another not only to honor the dead, but to placate the spirits of the animals on which the Eskimos depended for food. Festivals for the dead were celebrated by coastal Eskimos as far north as Point Hope.

Observances similar to the one described were also common along the Yukon River among the neighboring Ingalik, Athapaskan-speaking Indians whose culture was influenced considerably by their Eskimo neighbors and whose social life, including ceremonies in the *qasgiq*, has been described in detail by the anthropologist Cornelius Osgood. Of specific interest in the present context is his description of a "lucky pole ceremony," performed about the time of the winter solstice. For this ceremony a spruce tree was cut down to obtain a pole of a height equal to the distance between the floor of the *qasgiq* and the smoke hole. The pole was then decorated with hawk feathers and, to the accompaniment of a ceremonial song, brought into the *qasgiq* through the smoke hole. The pole's maker had previously presided at a ceremony in honor of the dead.

As the pole was brought into the *qasgiq*, the person holding the butt end, a shaman, made noises in imitation of birds and animals. At the end of the ceremony, some men tried to climb the pole, which had been made slippery by many greasy hands. The successful climber pulled the pole up through the smoke hole while all others present threw up their hands and yelled. According to Osgood, the purpose of the "lucky pole ceremony" was to increase the abundance of game animals.[2] The presence in the model *qasgiq* of figures raised on poles and also carrying them certainly suggests the depiction of a ceremony similar to those just described.

The importance of the *qasgiq* in Alaskan Eskimo life continued into the early 20th century. Its eventual decline was due in part to the gradual replacement of the aboriginal religion with Christian beliefs and, a related development, to the increasing importance of the nuclear family, in which the men lived at home with their wives and children. Even today, however, some villages maintain a structure like the traditional *qasgiq* which serves as a meeting place for the entire community, a place where local elections are held, movies are shown, and other events of general interest take place.

A model *qasgiq* like the one collected by Marcus Cherry is not unique in assemblages of 19th-century Eskimo material culture in museums. Similar models dating from the same period and from the same general area are to be found in the collections of the Sheldon Jackson Museum in Sitka, Alaska, the Lowie Museum of Anthropology at the University of California in Berkeley, and the Alaska State Museum in Juneau. The economic impetus for their construction may have been rooted in an attempt by native Americans in Alaska to capitalize on a vital aspect of their social and ceremonial life certain to impress outsiders. These early tourists were eager to bring back tangible examples of the exotic aspects of a culture with which they were becoming increasingly acquainted but only little understood.□

1. Nelson, E.W., The Eskimo about Bering Strait. 18th Annual Report, Bureau of American Ethnology, pp. 287-288.
2. Osgood, C., Ingalik Material Culture. Yale University Publications in Anthropology, no. 22, 1940, pp. 422-423.

Hunters in a Changing World

by Jean Treloggen Peterson

Photos by Jean Peterson and Warren Peterson

Today, hunting and gathering, the most enduring and prevalent lifeway known to humankind, is threatened in virtually every corner of the world, where it has been hidden from the incursions of modern technology. Without effective, rapid intervention the next century will see only remnants of today's hunting populations, and with the loss of that lifeway, the world will lose the environmental knowledge and the unique wilderness management skills commanded by these various peoples.

The great majority of earth's human population have made their living by hunting, fishing, and collecting wild fruits, grains, and vegetables. With the simplest of tools on the one hand, and a sophisticated knowledge of their environment on the other, these peoples move their households from place to place as they procure their food and other life essentials. Perhaps the most persuasive testimony to the stability, attractiveness, and efficiency of the hunting-gathering lifeway is that probably tens of thousands of hunters persist in their lifeway to this day, on each nonpolar continent, and despite the advance of an urban industrial technology and continued assaults on their wilderness environments and culture.

While a hunting-gathering lifeway is dependent on the existence and management of wilderness resources, it is only in recent centuries that hunters have sought retreat in order to inhabit these environments. For as long as we can know, these peoples have been an important part of the world economy. Early Chinese and Roman writers often mention hunter-gatherers as sources of wilderness products for places with more developed economies. Often these "primitive" peoples engaged in quite active world

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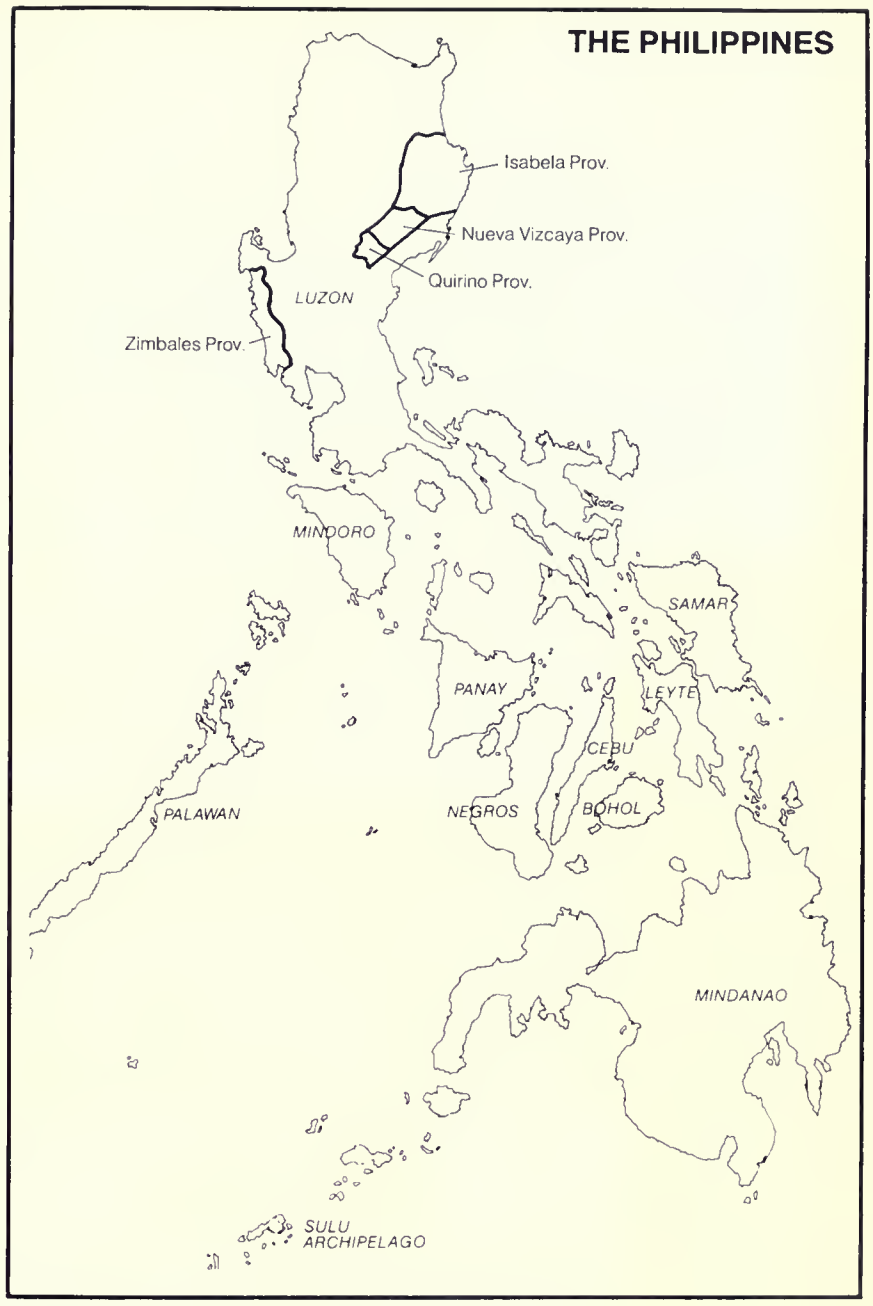
An Agta man fashions an arrow from a reed shaft and metal point shaped from a large nail. Fletching is attached with plant fiber and tree resin.

trade, as, for example, the ancient ivory commerce of Africa or the New World fur trade of the eighteenth and nineteenth centuries. Asian hunters have, from earliest recorded history, participated in such trade, supplying bird's nests, tree resins, rattan, spices, and other forest products in exchange for cooking vessels, textiles, and tools. To their nearest neighbors, usually farmers or herders, hunters have offered food and other wilderness products critical to the farming and herding lifeway.

Contradicting long-standing impressions of the hunting-gathering lifeway, anthropologists have demonstrated in the last decade that these peoples, whether dwellers in tropical forest (jungle), desert, or the arctic, provide themselves quite adequate food with a minimal labor investment. In large part their success is dependent on environmental knowledge and management. Often revering their wilderness home as a deity or seeing each object within it imbued with a sacred force, they show uncanny awareness of the location and habits of the plants and animals within it. They may utilize controlled burning to encourage propagation of certain plants for their own use, or to attract the animals they hunt. They understand the growing and reproductive cycles of the local species and, for example, propagate many of the wild food and medicinal plants they use. In some cases, as among the Philippine Negritos, women suckle the abandoned or orphaned young of the species they hunt. The same environmental concern is manifest in their negative reactions to environmental degradation such as irresponsible logging or dynamiting of fishing waters.

Often their ecological understanding is quite sophisticated: they recognize relationships among species at an impressively knowledgeable level. So exacting is this knowledge and associated skills that, in many groups, years are spent in mastering it and individuals do not achieve their full productive potential until they are 30 to 40 years of age. They understand the economic and medicinal uses of virtually hundreds of species, take only what they can use, and ingeniously use all of what they take. They are unquestionably unsurpassed in their knowledge of the usefulness and care of the wilderness. By living in harmony with their environment, managing its resources, and maintaining a low population density, they have preserved it and continue to harvest their livelihood from it. The Negrito hunters of the Philippines provide us with telling evidence of what the hunter-gatherer subsistence mode has been, its potential efficacy in a modern world, and the tragedy of its demise.



The hunting-gathering lifeway persists throughout much of the Sierra Madre range and adjacent coastal areas on Luzon, the northernmost large island of the Philippines. In Palanan, Isabela Province, on Luzon's northeastern coast, about 800 Negrito hunters, who call themselves Agta, share a bay watershed and adjoining mountains with approximately 10,000 non-Negrito farmers. The hunters typically move every seven to ten days during the dry season, January through September, three to five nuclear families erecting simple lean-to shelters at each site they inhabit, hunting pig and deer with bow and arrow, and fishing the riverine or coastal waters with simple spears or bows.

The rainy months, which inhibit mobility, demand somewhat more substantial dwellings, but any sunny day finds the Agta leaving this more permanent camp of eight to ten families,

An area of logging, carried out by a responsible company utilizing the best equipment available to prevent undue damage to the forest.

and scattering to favorite fishing and hunting sites. Some of them, mostly old persons who lack the strength or stamina for hunting, fishing, and gathering, plant small garden plots to roots or corn. In order to plant, they clear underbrush and saplings from a forested area, burn the rubble, and plant in the nutrient-rich ash. This age-old practice, called *swidden*, is highly effective in forested tropical areas with poor soils. Hunting and fishing, however, continue to provide a significant part of their caloric needs, and all of their animal protein needs. So successful are they at wild animal protein acquisition that they supply not only themselves, but also their Palanan farming neighbors, with an ample protein supply.

These Palanan farmers, physically and culturally different from the Agta, plant a few hectares* to corn, roots, and a little rice, using hand plows and water buffalo. They keep few domestic animals, and instead acquire animal protein from the Agta hunters. Over-all wild animal protein consumption for the Palanan and Agta inhabitants of that watershed averages six grams per capita per day, a figure which compares most favorably with overall animal protein consumption for developing nations. In exchange for the game and fish they provide, Agta receive corn and roots to satisfy most of their carbohydrate staple needs.

In addition to food exchanges, farmers rely on Agta labor during planting and harvest, and receive from them rattan for mending houses and farm implements, houseposts, honey, and often, as the farmers' families grow and land needs increase, the opportunity to take over abandoned Agta garden plots for development into farm fields. They often give Agta clothing and medicine, and shelter during typhoons.

The trade carried on by these two populations has probably existed since agriculture began in the area. Similar exchanges of protein for carbohydrate foods are reported, as well, among hunters or herders and farmers from elsewhere in Southeast Asia, India, Africa, and the New World. Beyond the actual trade relations in Palanan, the two populations have indirect but significant effects on each other's habitats and, consequently, livelihood. Agta, as noted, often turn over old garden plots to farming friends. By the time such transfer is made, grass has entered the garden site, rendering it untillable with the simple Agta swidden technology. Were there no agricultural peoples to move onto this land, these plots would be allowed to grow back to forest for several generations. Palanan farmers, however, with their plows, draft animals, and more labor-intensive systems can turn these plots to productive farmland. The initial Agta clearing spares them hundreds of hours of labor.

Agta hunting activity, too, is of significant benefit to their neighbors' farming endeavors. Not only does it supply their meat, but it provides a check on major crop pests—deer and pigs. Throughout the Philippines wherever any patchy forest remains, farmers often lose 30 to 40 percent of their crop to foraging game. In Palanan, too, farmers suffer high crop loss to game, especially in areas where clearing is active. Once an area is stabilized, however, they lose only 10 percent of their crop and receive meat which they value at five times the worth of the crop lost. Agta hunting is the most effective game control measure operating in the area.

The Palanan farmers have had an equally beneficial effect on Agta lifeway and subsistence. These farmers, whether clearing new fields or expanding Agta garden plots, continue to enlarge their fields piecemeal, taking several years to fully clear a three- to five-hectare field (equal to about two or three average city blocks). Typically they remove grasses, brush, and smaller trees, planting among the larger trees. When larger trees are finally cut, high above the ground to avoid the labor of cutting through the buttressing roots, the stumps are left to rot before removal is attempted, again to reduce labor investment. Should crop yields fall after several years, or family land needs change because of births or deaths, the land may be abandoned and allowed to regenerate to forest. Permanent crops, usually fruit trees, remain, eventually to be surrounded by their wild cousins.

These farming practices produce ideal conditions for the promotion of "edge effect," or "habitat mosaic"—terms ecologists use to refer to the attraction of some species of animals to areas offering environmental diversity. Those

**One hectare equals about 2.47 acres.*

Young people have their arms and upper torsos cut in geometric designs to produce decorative scars.

animal species which are dependent on two or more environmental types, feeding perhaps on grasslands at night and sheltering in the forest during the day, are drawn to these kinds of conditions, and exist in such areas in larger numbers than in a single environmental type. Palanan farm clearing provides the ideal mosaic of broken cover, forest, and, importantly, the high biomass of crop fields; in spite of Agta hunting and farmer efforts to deter game access to crops, pig and deer continue to feed in farm fields. The wild forest fruits, upon which pig and deer feed,

An Agta in the employ of a farmer, clears grass (Imperata cylendrica) *which has replaced the forest.*

This beach campsite provides easy access to freshwater marine and freshwater fishing and hunting in the forest.

Negritos of the Zambales area on a reservation. The area has been almost completely deforested and they now make a living principally by selling palm hearts and broom grass. An underground insect has become a major protein source, along with fish.

prosper as well under these clearing conditions; many forest fruits are light-seekers which grow in profusion on the edges of any clearing, or appear in the initial successional period of forest regeneration in abandoned gardens or fields.

Given these conditions it is apparent that Agta hunters, too, will cluster near those edges that offer easy access to both trade and game. Recreation of Agta campsites over four generations shows them hugging the peripheries of Palanan settlement for that period of time, exploiting what they call the "best" hunting sites, those adjacent to farmers' fields. Over a four-month period in 1978, Agta, inhabiting three river valleys and connecting mountains and coastal areas, killed 43.2 percent of pig and 26.7 percent of deer within 200 meters of farmers' fields, a total of 54.8 percent of pig and 33.3 percent of deer within 1.5 kilometers of fields. This bag, taken by only 17 hunters, provided nearly 1,000 kilograms (about 2,200 lbs.) of meat to the 53 Agta and Palanan families inhabiting the area over a four-month period. This represents an impressive supply of protein, particularly given that this was the "off" hunting season, the hot, drier period of the year when game are lean, and some have retreated to the cooler, forested interior.

What is less apparent than the attraction of game and hunters to the forest-field edge is the fact that farming expansion has apparently produced an absolute increase in the wild pig pop-

ulation. Pigs are an opportunistic species; that is, they produce many young, up to ten in a litter, many of which would perish under undisturbed forest conditions. The forest fruits upon which pig feed bear predominantly in October, November, and December, the period of heavy rain. By March they are barren. Pigs mate during these rainy months, and bear young in March and April, nursing them as late as July. The period of minimum forest food availability is the period of maximum vulnerability for young pigs. Their absolute population increase is effected by the fact that they feed on farmers' rice in March until it is harvested in May. May through July, they feed on corn. Given this dependence on farm crops, more young pigs survive. In fact, without Agta hunting activity they would become an intolerable crop pest; Agta hunting converts this pest to food.

Certainly these forest animals live in competition with an impoverished human population. They do, however, meet a portion of their food needs in the forest and, therefore, take fewer resources from humans than would domestic grazing animals. The Palanan case, with further study, promises a means of suggesting appropriate game-land management measures to provide a significant food supply in Palanan and elsewhere, without environmental degradation and without devotion of large land tracts exclusively to the production of animal protein foods, as in the development of grazing programs. This is a lesson of potential interest to the world, and of compelling interest to hungry developing nations. Game-land management alone cannot achieve these results; we need to draw, as well, on the skills, knowledge, and traditional subsistence modes of indigenous peoples who have been managing such environments long before intercropping, commercial fertilizers, industrialized agriculture, hydroelectric power, or other modern developments were conceived of. In most parts of the world, including the Philippines, twentieth-century encroachment is eliminating both the environment and the cultural skills essential to such sound management.

Palanan has been a relatively protected environment. No roads enter it; the rugged Sierra Madre, treacherous coastline, vulnerability to typhoons, and often dangerous currents have shielded the area from major industrial and agricultural development. The only logging company in Palanan must bring all equipment in by barge and float out logs. Under these adverse conditions the company has scarcely maintained a foothold. Elsewhere in the Philippines hunters have been displaced and disenfranchised. First, the Spanish destroyed vast forested areas in the construction and maintenance of their galleons; then smallpox, introduced from Europe, decimated both human and game populations. Later, in the nineteenth century, the Spanish introduced plantation agriculture, often to produce non-food crops such as tobacco and abaca, which claimed forested land and displaced food-producing farmers to upland forested areas.

More recently multinational agro-industry, logging, and mining have claimed traditional

This Agta man is collecting tree resin which will be used as an adhesive to attach an arrow point to the shaft.

An Agta woman prepares agal, *a starchy food processed from the pith of the carioca palm. It must be repeatedly leached after the pulp is removed from the palm.*

An Agta couple work together in the construction of their lean-to shelter. As he prepares cord from plant fiber she uses the cord to attach shingles.

Holiday Happenings

This holiday season make Field Museum a family destination! Here are some special places and events you won't want to miss:

☐ "Wild Things: Film Series for Families." Celebrate the wonders of the animal world through films, tours, and projects.

☐ "Parol—Lanterns from the Philippines." Make a Christmas decoration from another land in this Family Feature.

☐ "Maritime Peoples of the Arctic and Northwest Coast." See how Eskimos really live.

FOR HOLIDAY SHOPPING: The Museum Store. Unusual items such as tiny tinkling tree of brass bells from the Philippines; ethnic jewelry; mounted butterflies and shells; children's picture and coloring books; or dinosaur T-shirts—all of these help to make gift selection for anyone in any price category a snap.

AND for HOLIDAY FEASTING: The Museum Cafeteria. Special holiday foods—traditional Thanksgiving treats during November, Christmas pastries and fruit cake in December. Take home some fruit cake, or just feed your body and rest your feet in our spacious cafeteria!

hunting lands, or have again displaced other Filipinos who must in turn move in on their less sophisticated neighbors to claim land and rebuild the landscape in upland areas. These changes often lead to runoff, soil slump, and other destruction of fragile upland environments. Unchecked population growth, too, has led to a necessary geographical expansion of Philippine peoples. In many areas, once proud and efficient hunters have lost their lifeway and their dignity to one incursion or another. Dressed in rags, suffering skin diseases born of a degenerated diet, often coerced into prostitution, enticed to drink alcohol, ashamed of their new poverty, their kinky hair, and dark skin, they have had little opportunity or incentive for transition to another productive lifeway, and have clung tenaciously to some semblance of hunting-gathering.

Near Clark Field, the U.S. Air Force Base, in Luzon's Zambales Province, Negritos live off the trash piles and largess of the U.S. military. Lacking their own "jungle," they find periodic employment providing jungle training to military personnel. Elsewhere in Zambales Negritos, trapped between plantation agriculture moving up from the coast and logging in the mountains, have now become the victims of anomie. In Quirino and Nueva Vizcaya provinces, areas largely stripped by logging companies, Negritos travel long distances to obtain minor forest products, such as healing herbs and aphrodisiacs, for farmers who give them, in exchange, gin, tobacco, rice, and canned fish (many still observe a traditional taboo on the consumption of domestic meat). In Bicol, where coconut plantations have replaced the forest, they gather copra, and for their efforts are provided sardines, rice, alcohol, and tobacco. Like tens of thousands of others around the world, these Negritos represent a tremendous productive force robbed of their productivity, witnessing the destruction of their environment in this century.

Even on the inhospitable and isolated coast of Northeastern Luzon the last decade has had a dramatic impact. From 1970 to 1978 the number of farmers in the three river valley study area had quadrupled. This expansion by itself might have had little effect on the Agta there. More significant is the fact that the number of immigrants from outside Palanan had also quadrupled. These newcomers had brought with them preferences for a cash economy that places new value on land and labor, and for an animal protein production technology which renders farmer trade with Agta less attractive; they also had a penchant for cutting down trees, thus creating a naked landscape; made "pig bombs," which turn hunting grounds to mine fields; and showed a disdain for Agta lifestyle and dignity. The result is an environment and a culture on the threshold of irreversible change.

The immigrants brought with them the cash to buy land and the industry for clearing land and for generating more cash. The land in question in this particular area had been proposed by the Philippine government as an Agta civil reservation. Nonetheless, unscrupulous middlemen "purchased" plots of this land from the Agta for anywhere from $1.50 to $50 for a hectare, then sold it to immigrants. Most Agta are interested in having access to hunting territory, not to agricultural land. The presence of farmers has not usually created a problem; some of these newly arrived farmers, however, are different. They do not like Agta to hunt or camp on "their" land, and they do not like to trade in kind. Rather, they purchase what they want with cash, and pay cash for labor or for tree resins collected by the Agta. Agta suddenly have reduced access to hunting and trade and increased access to quantities of cash. With little investment incentive, many Agta spend their earnings on alcohol, gambling, alcohol, and sweetened snack foods such as cookies and candy.

The perspective and plight of these immigrant farmers deserves understanding as well. Most of them came to Palanan as victims of and refugees from landlessness and/or political unrest and the threat of insurrection. They purchased, often with no awareness of Agta land rights, "their" land with hard-earned cash. Certainly their preference for producing their own animal protein through the use of fish traps and their fish preservation methods, rather than engaging in transactions with Agta, cannot be condemned in spite of its effect on the Agta. Their treatment of the environment and indigenous populations, however, is open to criticism.

Unlike the Palanan farmers, they do not create an untidy edge, a patchy forest cover near their fields which might shelter game and prevent undue runoff. They strip the landscape whether or not they intend to plant that crop year. They then mine their fields and adjacent forests with homemade "pig bombs," explosive devices fashioned from matchheads, concealed in yams, and intended to wound foraging pigs. Also dangerous to humans, these bombs render a good deal of Agta hunting ground unfit for human access. What Palanan farmers have preferred to rely on Agta and time to provide—cleared fields, animal protein, and crop protection—these invaders prefer to achieve through their own intense labor investment, on their own terms.

Perhaps the most damaging effect the new-

comers have had stems from their scorn of all things Agta. While some immigrants have adapted successfully to the indigenous culture, others berate the Agta for their nakedness and "idleness," mock their dwellings, systematically teach them to be ashamed and, in extreme cases, get them drunk, cheat them at gambling, then threaten violent retaliation if they fail to make good their debts. It is very much the story of the native Americans replayed a century or two later, in a world that should have learned better. Ultimately, these farmers cannot be held responsible; they, too, are the products of the impact of "development" on the larger landscape.

Logging, plantation agriculture, industry, and dam projects displace farmers and hunters throughout the Third World, often disregardful of the very real economic value of those indigenous technologies or the environments they maintain and use so well. Rural areas are consequently deluged with landless newcomers, struggling for subsistence in an environment which offers diminished resources. Traditional communities often find their resources strained, as well, by the establishment of nonfood producing communities of loggers or miners in the area. On the northeast coast of Luzon, a three-day hike north of Palanan, a logging camp of about 4,000 persons depends heavily on the food production efforts of Palanan hunters, fishers, and farmers. While the Palanan economy might, with planning, expand to support this additional population, fortuitous exploitation of that environment produces a strain which can certainly bring about environmental degradation with time. Its immediate effect can be observed in the deteriorated health of the indigenes, and in death rates, particularly among children.

The hunters' loss is ours, not only in humanistic and spiritual terms, but in sound economic and environmental terms. As many begin to question the ability of multinational industrial complexes to sustain the earth and its life forms, it seems urgent that we assess the economic and environmental viability and sustainability of those lifeways which have survived for so long and apparently so well. They need not, and should not, be preserved as living museums. They should, however, be tapped to reveal means of using the earth's precious resources to man's benefit without destroying them. Their potential integration into the modern economy to provide food and wilderness products to a wider market, and to provide models for the management and restoration of fragile environments, should be explored. Ironically, this century, which may most need the maintenance skills hunter-gatherers can offer us, may destroy those populations which have, through successful environmental management, survived so long, as examples of the majority of humankind's tenure on this earth. □

An Agta woman constructs her family's lean-to shelter. A relative helps her by fashioning palm fronds into shingles.

OUR ENVIRONMENT

Natural Insecticides

Those electronic insect-zappers used to kill mosquitoes and other insect pests may seem a modern triumph, but two Canadian researchers have discovered that Nature, as usual, was already way ahead.

Members of the sunflower family, including daisies, black-eyed susans and marigolds, contain chemicals known as polyacetylenes, and as these chemicals sop up sunlight they become toxic to insects; their poison loses its punch in the dark. Researchers say they do not yet know precisely how the plants convert the sun's energy into a chemical insect-zap, but they do know that the zaps can be powerful. Says one; "We have found one compound to be more toxic to mosquito larvae in the light than DDT."

Carrots and wild parsnips contain similar chemicals that can kill caterpillars feeding on them during daylight hours. Researchers hope some of these compounds will be useful for crop protection and provide more environmentally acceptable alternatives to agriculturists.

Herring Gulls and Sunlight

Solar technology is still a comparatively new science, and new developments are reported almost daily. Birds, however, have been studying it for a long time.

A Ohio State University zoologist studying the behavior of herring gulls finds that on a very hot day the birds face directly into the sun, so that the rays hit the smallest possible amount of body surface and are reflected from the white feathers of the breast. On cool days, the burds turn their backs on the sun, absorbing heat through their grey wings. The scientist estimates that they absorb about four times as much heat with their backs turned to the sun.

The gulls also have learned that the more oblique the angle at which the sun strikes them, the less heat they receive, and they continually adjust this angle according to whether they are hot or cold.

It has long been known that certain cold-blooded vertebrates as well as invertebrates orient themselves to the sun in comparable ways.

Catfish on the March

Walking catfish that have multiplied into the millions have reached Tampa in a 15-year trek from south Florida, and may march into Georgia, wildlife researchers say.

The Asian fish, which move by dragging themselves by spikey pectoral fins "like infantrymen holding rifles in their elbows," are moving northward from pond to pond on a journey that began at Boca Raton 15 years ago when a dozen escaped from a fish farmer's exotic species collection.

The oxygen-breathing fish, which can crawl over land up to a mile a night, apparently have taken advantage of Florida's thousands of ponds, lakes, and canals to move anywhere from 180 to 250 miles, wildlife experts say.

Wolves Back to Glacier?

Researchers hope to reestablish a wolf population in Glacier National Park by using controlled burning techniques to create moose and beaver habitat, the wolves' primary prey. It is hoped the new food source will attract nearby wolves from Canada, where they are still relatively numerous.

New Weapon Against Red Fire Ant

No insect is loathed more than the red fire ant, *Solenopsis invicta*, in the southern United States. Entrenched in about 230,000 acres in 13 states, the ant lives in colonies of up to 50,000 insects that inhabit mounds up to three feet high and hard enough to wreck farm machinery that runs into them. The ants are aggressive and have a painful sting, which has been blamed for human deaths as well as that of livestock. Accidentally imported from South America around 1900, the ant has so far survived all efforts to do it in, including a federal eradication campaign that came to an end in the 1970's when the insecticide Mirex, which the ants were surviving anyhow, was banned as a potential human carcinogen.

The Department of Agriculture is now claiming considerable success with a new chemical that may work where insecticides failed. The substance, called MV-678, is a synthetic that mimics the ant's own juvenile hormones. It is dangerous, the department says, only to insects, and a "very narrow" range of insects at that. It does not kill the ants, but retards their growth until the ant society collapses.

In tests, MV-678 has been mixed with soybean oil and corn grits and sprayed around the ants' nests. Worker ants eat the baits and go home to feed the immature ants, including the next generation's cohort of workers, by regurgitation. The chemical swiftly degrades in the environment, according to the Agriculture Department, but not in the stomachs of the worker ants.

At first, the immature ants dosed with MV-678 by their nursemaids developed into malformed sexually mature ants, but later failed to develop at all, remaining in the juvenile stage—and staying home in the nest. Without the next crop of workers to feed it, the colony dies, the department reported; success was claimed in abolishing 80 to 90 percent of fire ant colonies with two applications of the hormone.

MV-678 was developed by Meyer Schwarz, a chemist with the Agricultural Research Service of the Agriculture Department in Beltsville, Md., and has been licensed to Stauffer Chemical Company for further development and testing.

The Lowly But Invaluable Earthworm

How long does an earthworm live? Estimates range from three to ten years— a short life, but one of great usefulness. In the course of years, wormcasts will build up a surface layer of soil of almost unbelievable depth, amounting in weight to several tons per acre per year. With their mineral-rich castings, the worms make available to plants the nutrients in the soil.

The diligent earthworm may well be the world's oldest labor saver, at least as far as man is concerned. Charles Darwin reminds us that long before man was around to invent the plow, "the land was, in fact, regularly plowed, and still continues to be thus plowed, by earthworms. It may be doubted whether there are many other animals which have played so important a part in the history of the world."

November and December at Field Museum

November 16 through December 15

Continuing Exhibits

"The Last and First Eskimos." October 9, 1982 to January 23, 1983. This photographic display captures a culture at its turning point. It documents a group of Eskimos including grandparents, who follow traditional ways, and their grandchildren, who live in the white man's world. It is the joint effort of photographer Alex Harris and psychiatrist Dr. Robert Coles. First floor, Hall 9.

"The People and Art of the Philippines." Through December 31, 1982. The 420 outstanding examples of Philippine arts and crafts reveal the fascinating history of this Southeast Asian nation. The prehistoric ceramics and gold pieces, the Catholic religious art, the gaily colored textiles from southern Muslim tribes and the intricate wood carvings from still-primitive northern peoples are among the exhibit highlights. Second floor, Hall 26.

Hall of Ancient Egyptians. "In the Shadow of the Pyramid" exhibit area, which updated Field Museum's already excellent Egyptian collection, will be one year old this November. The exhibit opens the interior of 4,000-year-old tomb rooms so that visitors can now admire their wall carvings at close range. Visitors may also view exhibits detailing life in prehistoric and early historic eras of Egypt, photomurals explaining how the tomb chapels came to Field Museum, and a replica of the chapel of Nakht on loan from the Metropolitan Museum of Art. This chapel displays facsimiles of some of the finest and most colorful Egyptian tomb paintings ever discovered. Ground floor, Hall J.

New Programs

"Wild Things: Film Series for Families." Parents and children can investigate the fate of some birds and animals in today's world through these films and related tours and art projects. The series is recommended for families with children age 5 and older. Free with Museum admission. Meet at Lecture Hall I near the West Entrance. Dec. 4—Sky Lords: Birds of Prey: "Last Stronghold of the Eagles," film; "Osprey's Domain," film; "We Care About Eagles," slide show; and "Eagle Food Chain Mobile," art activity. Dec. 11—Herds on Hoof: "Sable Island," film; "Big Horn," film; "A Walk on the Wild Side," tour; and "Wild Horse Animated Slide Show," art activity. Dec. 18—Water Birds: "Project Puffin," film; "The Loon's Necklace," film; "The Owl Who Married a Goose," film; and "Design a Duck," art activity.

"Parol—Star Lanterns from the Philippines." A Family Feature. Families can visit "The People and Art of the Philippines" exhibit on their own and then follow a trail of Philippine star lanterns to the North Meeting Room. After a demonstration on how to make this Philippine decoration, which symbolizes the Star of Bethlehem, families can make their own "Parols" out of bamboo and colored tissue. Free with Museum admission. Saturday, December 18 at 2:30 p.m.; Sunday, December 19 at 1 p.m.

Coming in January:

"Winter Fun." A series of weekend workshops for children will explore natural history through tours, films, and art activities. Members will receive a Winter Fun Brochure in December with a complete schedule. Call the Museum's Department of Education during business hours at 322-8854 to order a brochure.

Continuing Programs

Parent/Child Workshops. The four workshops on November 20 offer parent-child teams a chance to work on a craft project or join a participatory event. Sessions are keyed to child's age.

"Hadrosaur Habitat," 10 a.m. to 12 noon, for ages 5-6. Make a dinosaur habitat in your own shoe box.

"The Bookbinder's Art," 10 a.m. to 12 noon and 1 p.m. to 3 p.m., for ages 7-9. Make sheets of paper in the morning and in the afternoon bind them into a book.

"Naturalists Afield," 1 p.m. to 3 p.m., for ages 5-6. Use your senses to discover the world of nature.

"Tribal Markings," 1 p.m. to 3 p.m., for ages 7-8. Learn how other cultures use personal decorations and then decorate yourself.

Edward E. Ayer Film Lecture Series. Travel around the world via film every Saturday afternoon in

November and December at Field Museum

November. Narrated by the filmmakers themselves, these free 90-minute film/lectures begin at 1:30 in James Simpson Theatre. Admission is through the West Entrance. Members receive priority seating. Nov. 20, "Antarctica," with Ted Walker; Nov. 27, "Italy," with Ted Bumiller.

WEEKEND EVENTS LINE. A prerecorded telephone message gives up-to-date information about such weekend programs as Discovery Programs, Family Features, films, and special programs. Call (312) 322-8854 weekends.

WEEKEND DISCOVERY PROGRAMS. New vistas of natural history are opened through these tours, films, slide programs, and participatory activities. On Nov. 20, 11:30 to 3:30, a day of tours and demonstrations is planned to celebrate the first anniversary of the opening of the tomb chapel room of Unis-Ankh and Netjer-User. Nov. 27, 1:30 p.m., "The Ancient Egyptians"; Nov. 28, 1:30 p.m., "Sky Lords: Birds of Prey." December's programs include tours of Northwest Coast exhibit, tours of the Egyptian Hall, and slide programs on dinosaurs and dinosaur specialists. Dec. 4, 1 p.m., "Indians of Tide and Tundra"; Dec. 5, 1 p.m., "Cope and Marsh: The Saurian Scandals"; Dec. 11, 1:30 p.m., "Red Land/Black Land"; Dec. 12, 1 p.m., "Sauropods: The Ultimate Dinosaurs."

WINTER JOURNEY. "Eskimos—Arctic Hunters." This self-guiding tour will help you discover how the Eskimo hunters succeeded in the world's most difficult environment. Free *Journey* pamphlets are available at Museum entrances.

VOLUNTEER OPPORTUNITIES. Volunteers are needed to give Geology programs to school groups and to give weekday and Saturday programs in the Pawnee Earth Lodge. Also limited openings for volunteers in Geology and Zoology. Contact Volunteer Coordinator at 922-9410, ext. 360.

MUSEUM HOURS. The Museum is open daily from 9 a.m. to 4 p.m. The free day is Thursday. It is closed on Thanksgiving, Christmas Day and New Year's Day.

THE MUSEUM LIBRARY is open weekdays from 9 a.m. to 4 p.m. Obtain a pass at the reception desk, main floor. The Library will be closed Thanksgiving, the day before Christmas, and on Christmas Day.

MUSEUM PHONE: (312) 922-9410

Holiday Happenings

This holiday season make Field Museum a family destination! Here are some special places and events you won't want to miss:

☐ "Wild Things: Film Series for Families." Celebrate the wonders of the animal world through films, tours, and projects.

☐ "Parol—Lanterns from the Philippines." Make a Christmas decoration from another land in this Family Feature.

☐ "Maritime Peoples of the Arctic and Northwest Coast." See how Eskimos really live.

FOR HOLIDAY SHOPPING: The Museum Store. Unusual items such as tiny tinkling tree of brass bells from the Philippines; ethnic jewelry; mounted butterflies and shells; children's picture and coloring books; or dinosaur T-shirts—all of these help to make gift selection for anyone in any price category a snap.

AND for HOLIDAY FEASTING: The Museum Cafeteria. Special holiday foods—traditional Thanksgiving treats during November, Christmas pastries and fruit cake in December. Take home some fruit cake, or just feed your body and rest your feet in our spacious cafeteria!

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For Christmas Give Field Museum

Whether you are trying to decide on a Christmas gift for the small child or for "the man who has everything," a gift of Membership in Field Museum is always appropriate.

For the adult, a Membership can provide a wealth of opportunities to further explore the realm of natural history; for the child it can open the doors to a lifetime of scientific interest or professional endeavor. Infinitely more than a storehouse of fascinating specimens and exhibits, Field Museum offers to its Members at every age level a varied selection of exciting learning experiences via the classroom, workshop, laboratory, film lecture, or field trip.

Perhaps equally important: with a Field Museum Membership you are giving a shared relationship, for Field Museum is indeed its Members.

clip and mail this coupon or facsimile

to: Membership Department
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Il 60605

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☐ Please bill me
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FIELD MUSEUM OF NATURAL HISTORY BULLETIN

December 1982

Calendar for 1983

Field Museum of Natural History Bulletin

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Field Museum of Natural History
Founded 1893

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Director: Lorin I. Nevling, Jr.

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1983: The Year of the Plant
by William Burger, chairman, Department of Botany

Appointment Calendar for 1983
Featuring botanical photos taken in or near Chicago by William Burger

COVER

Spring beauty, *Claytonia virginica*.
Photo by William Burger

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Turban squash (*Cucurbita maxima* variety *turbaniformis*). These specimens were used as models for the reproduction on view in the Hall of Useful Plants (Hall 28).

1983: The Year of the Plant

by William Burger

Chairman, Department of Botany

The calendar for 1983, comprising this issue of the *Bulletin*, features plant life and is part of Field Museum's focus on botany in 1983. Plant science is one of the four major research areas at Field Museum, the others being anthropology, geology, and zoology.

What is especially significant about botany at Field Museum in 1983 is the reopening of one of our largest halls, Plants of the World (Hall 29). Renovation will include reinstallation of all exhibits (except dioramas, which remained intact), reorganization of materials, rehanging the mural-size paintings, installing new lighting and carpeting, and constructing a lounge that will look eastward to Lake Michigan

Field Museum houses the largest and most comprehensive collection of plant models in the world; these form the core of the newly renovated hall. The model-building program was begun by former Museum president Stanley Field in 1909 and continued for over half a century. The models cover all groups of plants, from algae and fungi to conifers and flowering plants. A new exhibit floor plan will allow visitors to compare related groups of plants in a more meaningful way. Special areas are devoted to the naming of plants, the system of classification, flowers and their pollination systems, and dispersal of seeds and fruit. We believe Hall 29 to be the world's largest single botanical museum exhibit. Don't miss it when it opens in 1983.

Palos Park pond in winter

JANUARY

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
DECEMBER S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**FEBRUARY** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28					**NEW YEAR'S DAY** **Museum closed** 1
2 *Sun closest to Earth (91.4 million miles away)*	3	4 *Quadrantid meteor shower (100/hr)*	5 last quarter	6	7	8
9	10	11	12	13 new moon	14	15 MARTIN LUTHER KING'S BIRTHDAY (1929-68)
16	17	18	19 first quarter	20	21	22
23/30	24/31	25	26	27	28	29

Fungus: *Mycena leaiana*

FEBRUARY

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JANUARY S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**MARCH** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1	GROUNDHOG DAY 2	3	4 last quarter	5
6	7	8	9	10	11	LINCOLN'S BIRTHDAY (1809-65) 12 new moon
13	ST. VALENTINE'S DAY 14	SHROVE TUESDAY 15	ASH WEDNESDAY 16	17	18	19
20 first quarter	21 PRESIDENT'S DAY	22	23	24	25	26
PURIM 27 full moon	28					

Trees in fog

MARCH

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
FEBRUARY S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	**APRIL** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1	2	3	4	5
6 *last quarter*	7	8	9	10	11	12
13	14 *new moon*	IDES OF MARCH 15	16	ST. PATRICK'S DAY 17	18	19
first day of spring 20	21	22 *first quarter*	23	24	25	26
PALM SUNDAY 27	28 	**PASSOVER** 29	30	31		

Fungus: *Laetiporus sulfureus*

APRIL

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
MARCH S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**MAY** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				GOOD FRIDAY 1	2
EASTER 3	4	5 last quarter	6	7	8	9
10	11	12	13 new moon	14	15	16
17	18	19	20 first quarter	21 *Lyrid meteor shower (15/hr)*	22	23
24	25	26	27 full moon	28	29	30

Puccoon (*Lithospermum carolinense*) on sand dune

MAY

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	Field Museum opened (Grant Park) 1921 2	3	4 *Eta Aquarid meteor shower (18/hr)* *last quarter*	5	6	7
MOTHER'S DAY 8	9	10	11	12 *new moon*	13	14
15	16	17	18	19 *first quarter*	20	21
PENTECOST 22	23	24	25	26 *full moon*	27	28
29	30 **MEMORIAL DAY**	31				

APRIL

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

JUNE

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Yellow and orange hawkweed (*Hieracium* species) and daisies

JULY

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JUNE S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	**AUGUST** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				1	2
3 last quarter	INDEPENDENCE DAY 4	5	6 *Sun furthest from Earth (94.5 million miles away)*	7	8	9
10 new moon	11	12	13	14	15	16 first quarter
17	18	19	20	21	22	23
24 full moon 31	25	26	27	28	29	30 *Delta Aquarid meteor shower (38/hr)*

Goatsbeard (*Tragopogon pratensis*) in fruit

AUGUST

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 last quarter	2	3	4	5	6
7	8 new moon	9	10	11 *Perseid meteor shower (65/hr)*	12	13
14	15 first quarter	16	17	18	19	20
21	22	23 full moon	24	25	26	27
28	29	30	31 last quarter			

JULY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

SEPTEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Chicory (*Cichorium intybus*)

SEPTEMBER

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
AUGUST S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**OCTOBER** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			1	2	3
4	LABOR DAY 5	6 new moon	7	ROSH HASHANA 8	9	10
11	12	13 first quarter	14	15	Field Museum founded 1893 16	YOM KIPPUR 17
18	19	20	21	22 full moon	first day of fall 23	24
25	26	27	28	29 last quarter	30	

White birch (*Betula papyrifera*) in autumn

OCTOBER

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
SEPTEMBER S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	**NOVEMBER** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					1
2	3	4	5	6 new moon	7	8
9	10 COLUMBUS DAY	11	12	13 first quarter	14	15
16	17	18	19	20 *Orionid meteor shower*	21 full moon	22
23/30	24/31 HALLOWEEN	25	26	27	28 last quarter	29

Fungus: *Mycena sanguinolenta*

NOVEMBER

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
OCTOBER S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**DECEMBER** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1	2	3	4 new moon	5
6	7	GENERAL ELECTION DAY 8	9 *Taurid meteor shower (16/hr)*	10	VETERANS DAY 11	12 first quarter
13	14	15	16	17	18	19
20 full moon	21	22	23	24 **THANKSGIVING** **Museum closed**	25	26
ADVENT 27 last quarter	28	29	30			

Daisy (*Chrysanthemum leucanthemum*) with white crab spider

DECEMBER

FIELD MUSEUM OF NATURAL HISTORY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
NOVEMBER S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	JANUARY S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			HANUKKAH 1	2	3
4 *Annular solar eclipse (N.E. No. America)* new moon	5	6	7	8	9	10
11	12 first quarter	13 *Geminid meteor shower (55/hr)*	14	15	16	*shortest days of year (9 hrs, 5 min) Dec. 17-25* 17
18	19 *Penumbral eclipse of moon* full moon	20	21	first day of winter 22	23	24
CHRISTMAS Museum closed 25	26 last quarter	27	28	29	30	31

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